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METAL EXPOSITION NUMBER

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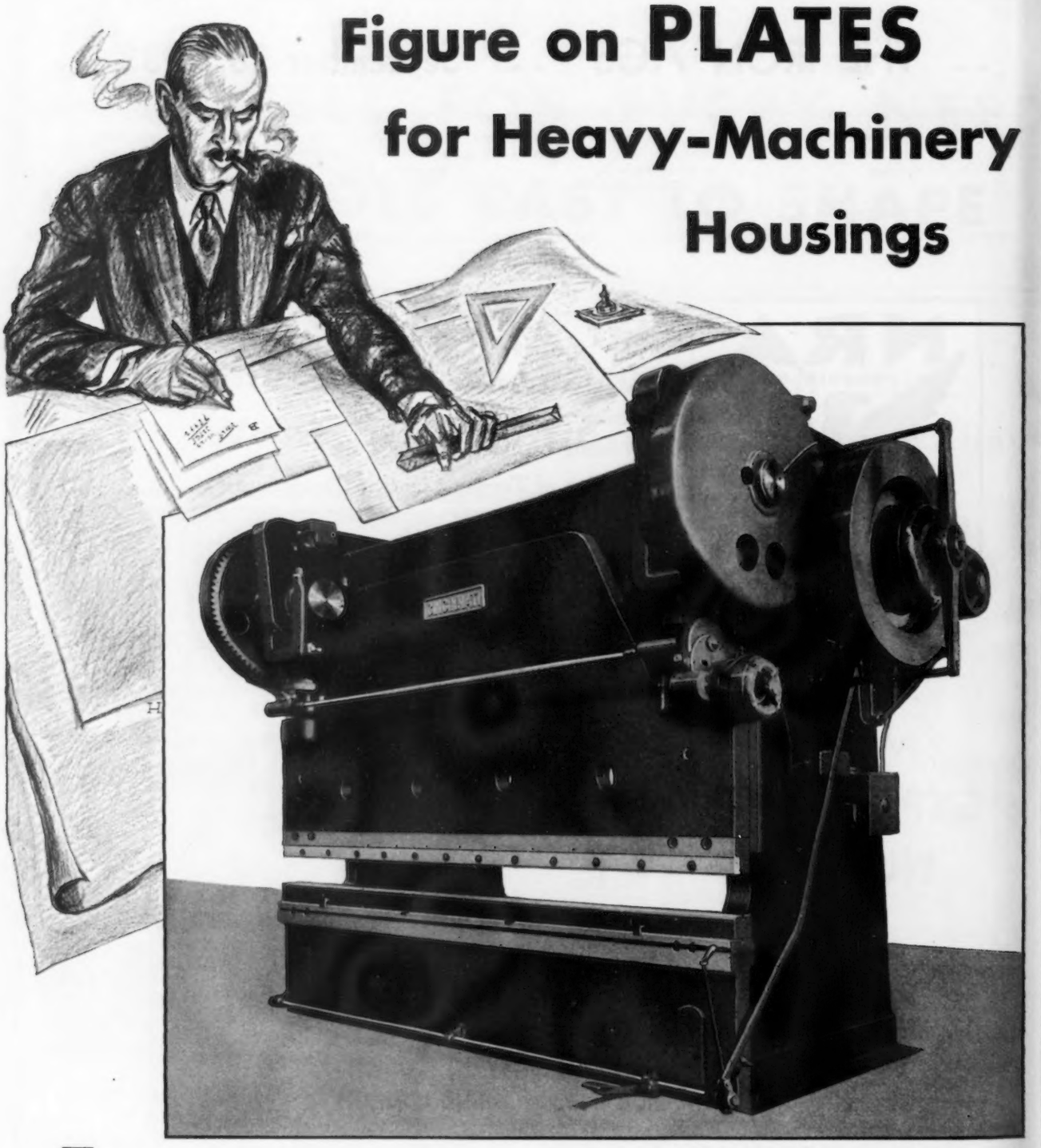

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BETHLEHEM STEEL PLATES

▲▲▲ THE IRON AGE ▲▲▲

ESTABLISHED 1855 SEPTEMBER 28, 1933 Vol. 132, No. 13

Ab Uno Ad Multos

FROM one to many. From Tubal Cain, the world's first legendary worker in metals, to the engineers, metallurgists and technicians who will throng to Detroit's National Metal Congress next week.

What a dramatic story of accomplishment it is! A story to fire the imaginations and ambitions of the thousands who are following and who will follow the pioneer footsteps of the man who first harnessed the miraculous power of fire and who thus opened the door to Nature's concealed treasure house of technical accomplishment.

To these followers of Tubal Cain, who have carried the torch of progress that he lighted, this issue of The Iron Age is dedicated.

The Structure of an A

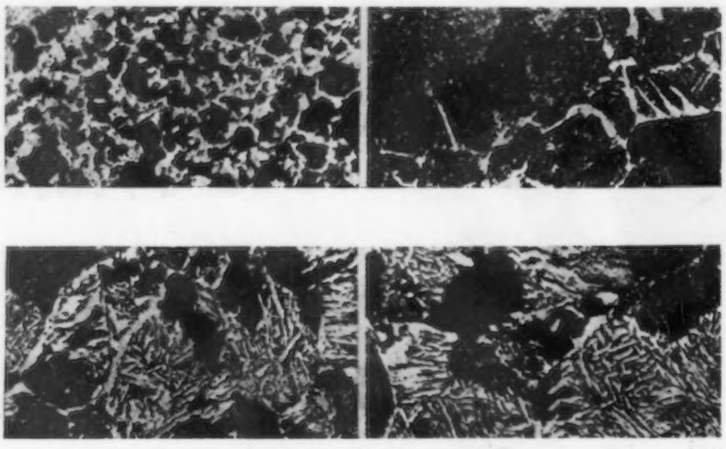


FIG. 1—Structure of 1-in. normal sample cooled in still air from 750 deg. C (upper left). Fig. 2—Same as 1, but cooled from 950 deg. (upper right). Fig. 3—Same as 1, cooled from 1000 deg. (lower left). Fig. 4—Same as 1, cooled from 1100 deg. (lower right). Photomicrographs etched in 5 per cent Nital for 5 sec., 250 dia.

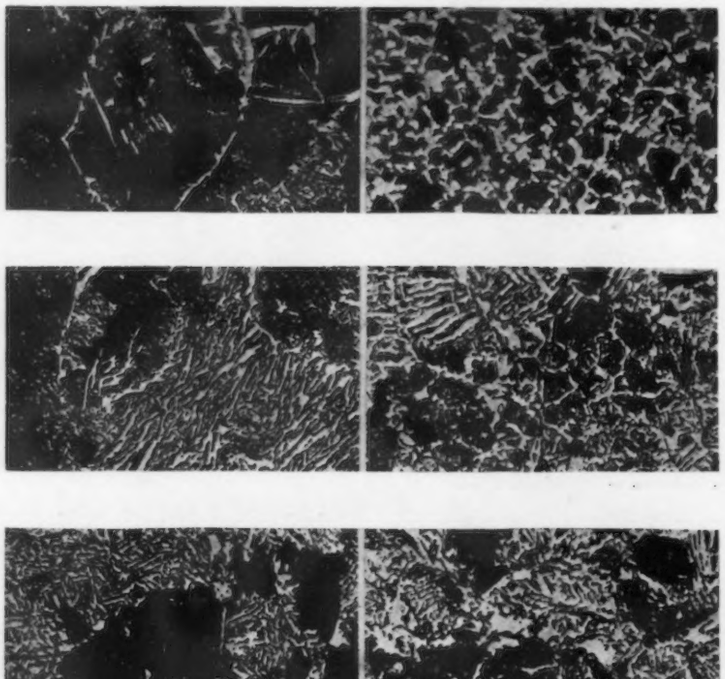


FIG. 5—Structure of sample heated to 1107 deg. C. for 15 min. and cooled in 626 sec. (upper left). Fig. 6—Sample heated to 858 deg. C. for 15 min. and cooled in 221 sec. (upper right). Fig. 7—Sample heated to 1115 deg. for 15 min., cooled in 482 sec. (center left). Fig. 8—Sample heated to 945 deg. for 15 min., cooled in 337 sec. (center right). Fig. 9—Sample heated to 1097 deg. for 15 min. and cooled in 380 sec. (lower left). Fig. 10—Sample heated to 991 deg. for 15 min., cooled in 437 sec. (lower right). All samples cooled 850 to 350 deg. C. Photomicrographs etched in 5 per cent Nital for 5 sec., 250 diameters.

IN previous work[1] it was discovered that when a series of steel samples were heated and then normalized, or cooled in still air at about 23 deg. C., and then examined microscopically there was an interesting microstructure evidence if the specimen's original temperature was in excess of 980 deg. C. The following work is an inquiry into the condition which had resulted in this formation. This microstructure will be referred to as Widmanstatten. Justification for the use of this term is offered in Figs. 3 and 4—reproductions of photomicrographs of samples of one of these steels, which had been heated to 1000 and 1100 deg. C., respectively, prior to cooling. More usual structures are shown in Figs. 1 and 2—sections of samples of this steel, which had been normalized at 750 and 950 deg. C., respectively. The steel was of the following analysis: Carbon 0.33, Manganese 0.54, Nickel 1.27, Chromium 0.70.

Since, after the forging experiments had been completed, insufficient of this steel was left for further investigation, a bar of the following analysis, 1⅛ in. in diameter, was obtained for the tests described below: Carbon 0.33, Manganese 0.69, Nickel 1.30, Chromium 0.73.

The samples were all machined from the same bar but varied from ½-in. diameter to 1⅛-in. diameter by ⅛-in. steps. Two holes were drilled in each sample, one axially to a depth equal to half the length of the sample, and the other slightly off center and parallel to the first. These holes were used to accommodate a thermocouple and a handling bar respectively. The heating furnace was made of globars and could be minutely regulated. The samples were protected by means of a silica tube, and were prevented from oxidizing by means of a stream of nitrogen or by evacuating the furnace.

The sequence of operations during the treatment of individual samples were as follows:

The furnace was raised to and held at a predetermined temperature (which will be referred to as $\theta_{max.}$) for about ¾ hr. The heating of the sample was done gradually, and accurately

[1] O. W. Ellis, "Further Experiments on the Forgeability of Steel," *Transactions*, American Society for Steel Treating, Vol. 21, 1933, p. 673.

ar Alloy Steel ▲ ▲ ▲

By OWEN W. ELLIS
Director of Metallurgical Research,
Ontario Research Foundation, Toronto, Canada

measured by a calibrated thermocouple. After holding at the maximum temperature for 15 to 130 min. the sample was permitted to cool at a regulated rate. A careful chart of the cooling temperatures was made. Most of the work was done on samples ¾-in. diameter and less, since larger samples generally cooled too slowly to cause the formation of the Widmanstatten structure.

With rare exceptions, the cooling curves covered the range 850-150 deg. C. After each sample had cooled to 150 deg. C. the thermocouple, which measured its cooling curve, was removed and the calibration was rechecked. The sample was then cut in half, with the cut being made at right angles to the axis of the thermocouple hole. The solid half was then carefully ground, polished, etched for 5 sec. (usually in a fresh solution of 5 parts of concentrated nitric acid in 100 parts of ethyl alcohol), and finally examined under the microscope. Photomicrographs at 250 diameters were made of all the prepared samples; some, however, were subjected to more critical examination, and of these photographs at 750 diameters were taken.

Structure Related to Cooling

Here the results of several series of experiments will be described which had for their object the discovery of the conditions requisite for the production of the Widmanstatten structure in this steel. The structures observed in the samples subsequent to cooling from $\theta_{max.}$ after having been raised to and held at that temperature for 15 minutes, have been divided into four main groups, which are classified in Table I.

The author has found it difficult to fit these structures into the classification adopted by Robertson,[2] though there is similarity between Groups 1 and 2 in both classifications. Typical photomicrographs of these structures are reproduced in Figs. 5-15.

The term "conglomerate" has been used to designate the continuous dark-etched areas which characterize some of the structures classified in Table I. This has been done to avoid the necessity for distinguishing between structures which are constituted of solid solution of carbon, etc. in body-centered iron and iron carbide, but in which these constituents vary in their mode of distribution. "Conglomerate" might well be referred to as a "species" of structure, of which pearlite, sorbite, troostite, and mixtures of these are "varieties." In the samples examined the conglomerate was generally troostitic.

[2] Robertson, *Journal*, Iron and Steel Institute, Vol. 114, 1929, p. 391.

▲ ▲ ▲

THE author elaborates his previous work, and determines the conditions under which a Widmanstatten structure appears in steel containing 0.33 per cent carbon, 0.69 per cent manganese, 1.30 per cent nickel and 0.73 per cent chromium. It is shown that the structure is greatly enhanced if the maximum heating temperature is raised beyond 850 deg. C. At a later date it will be shown that under suitable cooling conditions a steel can exhibit four critical points. At one of these points the alternating needles of body-centered solid solution and interstitial "conglomerate" form the Widmanstatten structure. Mr. Ellis will present the complete paper at the A.S.S.T. meeting at Detroit on Oct. 3.

The term "Widmanstatten" refers to the continuous striped areas which characterize some of the structures. These areas comprise (1) blades or plates of solid solution of carbon, etc., in body-centered iron (light portions) and (2) interstitial matter (dark portions), composed of solid solution of carbon, etc., in body-centered iron and iron carbide, i.e., the products of the dissolution of saturated solid solution of carbon, etc., in face-centered iron. This interstitial matter corresponds in constitution, though not of necessity in chemical composition, to the conglomerate.

The structures obtained subsequent to cooling at various rates from a series of temperatures between about 850 and 1100 deg. C., the samples having been heated to and held at $\theta_{max.}$ during 15 minutes, are filed in Table II and arranged graphically in Fig. 16. In Table II the samples have been arranged in order of cooling time (850-350 deg. C.).

From Table II and Fig. 16 it will be seen that when $\theta_{max.}$ falls below about 975 deg. C., the time of cooling (850-350 deg. C.) requisite for the production of the Widmanstatten structure decreases somewhat, and, further, that when $\theta_{max.}$ falls below about 915 deg. C. (1680 deg. F.), this time of cooling falls to about one-third that when θ_{max} is greater than 975 deg. C.

In samples which had been heated to and held at temperatures below about 915 deg. C., the time of cooling became important in its effect upon the amount of solid solution of carbon, etc., in body-centered iron which formed before the face-centered solid solution became saturated to the point where iron carbide precipitated (i.e., at the eutectoid temperature). The proportion of conglomerate in these samples became distinctly less as their time of cooling (850-350 deg. C.) increased. This effect of cooling rate was not visible in samples which had been heated to temperatures above about 915 deg. C., simply because the maximum times of cooling in these experiments only just prevented the formation of Widmanstatten structures.

Grain Size of Steel

In samples consisting entirely of conglomerate, the sizes of the grains varied in accordance with the temperatures ($\theta_{max.}$) to which the samples had been raised. The relation between $\theta_{max.}$ and the average number of grains of conglomerate per square millimeter of cross section is shown in Table III and in Fig. 17.

It will be seen: (1) that a marked increase in grain size resulted from

Table I

Classification of Structures Observed in the Steel Subsequent to Various Rates of Cooling

Group 1	Grains of conglomerate enclosed in ferritic network	Figs. 6, 7
Group 2a	Grains of conglomerate, together with grains of conglomerate plus Widmanstatten, both enclosed in a ferritic network	Figs. 8, 9
Group 2b	Proportions of conglomerate and Widmanstatten approximately equal	Figs. 10, 11
Group 2c	Widmanstatten definitely in excess	Figs. 12, 13
Group 3	Widmanstatten only	Figs. 14, 15
Group 4	Widmanstatten with martensitic areas	Fig. 16

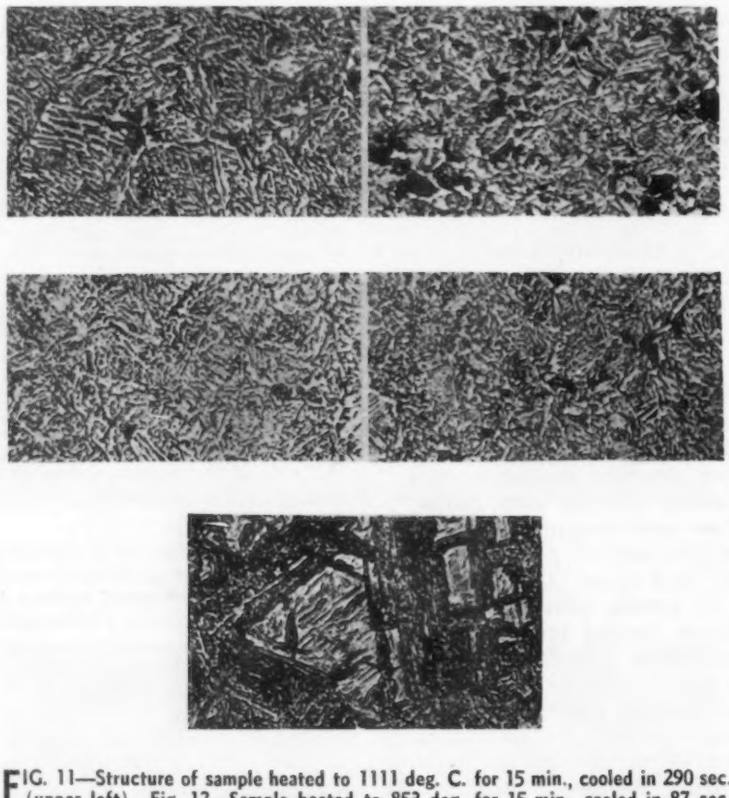


FIG. 11—Structure of sample heated to 1111 deg. C. for 15 min., cooled in 290 sec. (upper left). Fig. 12—Sample heated to 853 deg. for 15 min., cooled in 87 sec. (upper right). Fig. 13—Sample heated to 1002 deg. for 15 min., cooled in 197 sec. (center left). Fig. 14—Sample heated to 891 deg. for 15 min., cooled in 80 sec. (center right). Fig. 15—Sample heated to 1117 deg. for 15 min., cooled in 97 sec. (bottom). All samples cooled 850 to 350 deg. Photomicrographs etched in 5 per cent Nital for 5 sec., 250 diameters.

Table II

Time of Cooling (850-350 Deg. C.) (Sec.)	$\theta^{max.}$ (15 Min. Heating) (Deg. C.)	Structure 1	2a	2b	2c	3	4
734	1014	+					
684	1036	+					
671	1083	+					
626	1107	+					
630	1006	+					
614	1108		+				
585	993	+					
532	940	+					
492	1037		+				
482	1115		+				
478	919	+					
471	893	+					
449	847	+					
449	918	+					
437	991			+			
413	1099	+					
409	1041			+			
380	1097			+			
337	945		+				
323	993				+		
323	947	+					
320	1001				+		
299	1051				+		
298	932		+				
290	1111				+		
263	928				+		
251	938				+		
251	1037				+		
247	978					+	
240	874	+					

Time of Cooling (850-350 Deg. C.) (Sec.)	$\theta^{max.}$ (15 Min. Heating) (Deg. C.)	Structure 1	2a	2b	2c	3	4
234	936				+		
221	858	+					
210	978					+	
209	1069					+	
207	995					+	
205	893	+					
198	1002					+	
194	891		+				
189	900	+					
185	865	+					
182	1017					+	
175	1049					+	
170	874	+					
169	854	+					
165	1043					+	
150	893		+				
149	900		+				
139	930					+	
123	936					+	
109	892				+		
98	903				+		
96	892					+	
92	875					+	
89	874					+	
87	853					+	
85	1048						+
85	1124						+
80	891					+	
75	1121						+

heating samples to temperatures above 1000 deg. C., and (2) that grain growth proceeded most rapidly within the temperature range 900-1000 deg. C.

Samples heated (15 min.) to temperatures within the range 900-950 deg. C. contained both large and small grains of conglomerate. A structure typical of such material is shown in Fig. 18, a reproduction of a photomicrograph of a sample that had been heated to and held at 940 deg. C. during 15 min. and had cooled from 850 to 350 deg. C. in 532 sec.

It may be noted that, whatever the type of structure within the grains, their size appeared to be the same for any given value of $\theta_{max.}$ When rates of cooling resulting in a Widmanstatten structure (Group 3 or Group 4) were employed, this opinion found support, not upon observation of grain size, but rather upon observations of the size of the blades and plates in the structure.

Time at $\theta_{max.}$ Affects Structure

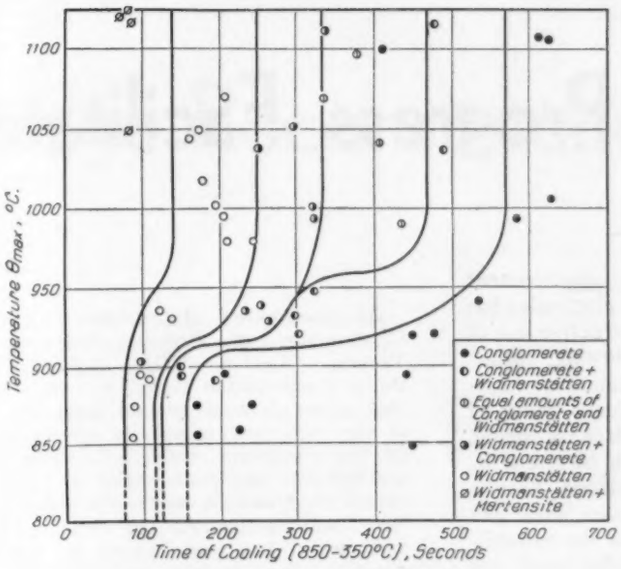
Experiments were made to determine the effect of time of heating at $\theta_{max.}$ on the structure of the steel. In these the time of heating to and holding at $\theta_{max.}$ was extended from 15 to 130 min.

Table III

Sample Number	θ_{max} (Deg. C.)	Grains per Sq. Millimeter
N.S. 115	1108	110
212	1083	113
211	1936	115
209	1006	119
207	993	239
168	940	530
198	919	964
170	893	1204
183	874	1331
178	854	2152

In one series $\theta_{max.}$ was approximately 1100 deg. C. (2010 deg. F.). The structures produced as a result of cooling at different rates from this temperature after 130 min. heating were practically identical with those shown in Figs. 5, 7, 9, 11, 13 and 15—photomicrographs of samples which were heated to about 1100 deg. C. for 15 min. before cooling at about the same rates as the samples in this series.

Fig. 19 shows the structure of sample N.S.126, which was heated to and held at 1100 deg. C. during 130 min. and then cooled from 850 to 350 deg. C. in 351 sec. The likeness between this structure and that shown in Fig. 10 (sample N. S.114, $\theta_{max.}$ 1097 deg. C., time of heating 15 min., time of cooling 380 sec.) is manifest. The structural similarity between other samples heated to about the same temperature for different times (15 and 130 min.), though cooled at about the same rates, was in many cases even more striking. What was true of samples heated to 1100 deg. C. for the two different times and cooled at different rates was true of the samples heated to about 1050 and 1100 deg. C.



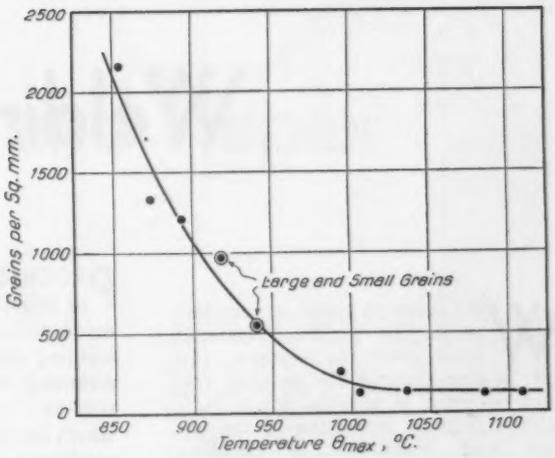


Fig. 16 (at left)—Effect of time of cooling on structure of samples heated to different temperatures.

Fig. 17 (above)—Relationship between maximum temperature and grain size.

It was only when $\theta_{max.}$ was below 1000 deg. C. that the time of heating became important in its effect on structure. Grain growth then became evident after prolonged heating. For example, sample N.S.170 was heated to and held at 893 deg. C. during 15 min., then cooled (850-350 deg. C.) in 205 sec. The structure of the sample was of group 1, Table I (Fig. 6). On the other hand, sample N.S.174, which was heated to 900 deg. C. during 130 min. and cooled (850-350 deg. C.) in 189 sec., had the structure shown in Fig. 21. At a few well-marked centers throughout the section were large grains of Widmanstatten structure. The smaller grains were of about the same size as those in sample N.S.170.

Fig. 21 shows a similar structure in a sample (N.S.188) which had been heated to 875 deg. C. during 130 min. and subsequently cooled from 850 to 350 deg. C. in 192 sec. The structure within all the larger grains in this sample was like that in Fig. 22. It was Group 2b.

Samples heated for the longer period at about 850 deg. C. did not show the same grain growth as did the samples heated for the same time at higher temperatures. Fig. 24 shows the largest grain (only seven others approached it in size) found in an entire cross section of a sample ⅝ in. in diameter (N.S.180), which had been heated to and held at 857 deg. C. during 130 min. and had been cooled (850-350 deg. C.) in 225 sec. This structure may be compared with Fig. 6, that of a sample (N.S.179) heated to and held at 858 deg. C. during 15 min. and cooled (850-350 deg. C.) in 221 sec. The cooling curves of the two samples agreed closely except at the eutectoid temperature; the carbon change beginning at 640 deg. C. ± in the latter sample, and ending at 585 deg. C. ± in the former. The carbon change began in the former at about 600 deg. C.

It will be seen that grain growth is slow at 850 deg. C. and below. The use of the word "below" here needs explanation, since the Ac_3 point for this steel was in the neighborhood of 790 deg. C.—only 60 deg. C. below $\theta_{max.}$ when $\theta_{max.}$ was 850 deg. C. Grain growth quickens as $\theta_{max.}$ rises from 850 to 950 deg. C. At temperatures of 975 deg. C. and upwards it proceeds so rapidly that equilibrium is reached within a few minutes of the introduction of the sample into the heating zone of the furnace; hence, little or no change in structure results from pro-

(Concluded on Page 82)

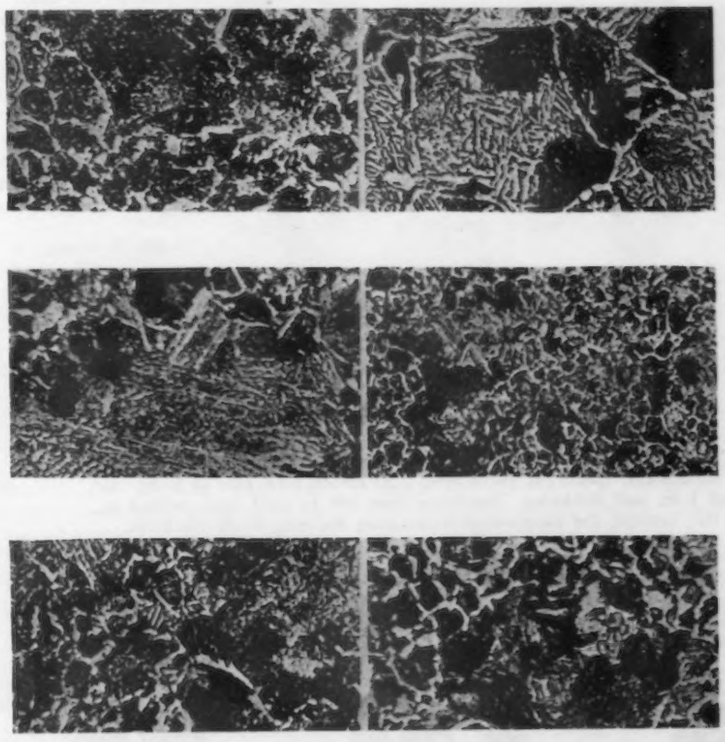


FIG. 18—Structure of sample heated to 940 deg. C. for 15 min. and cooled in 532 sec. (upper left). Fig. 19—Sample heated to 1100 deg. for 130 min. and cooled in 351 sec. (upper right). Fig. 20—Sample heated to 900 deg. for 130 min. and cooled in 189 sec. (center left). Fig. 21—Sample heated to 876 deg. for 130 min. and cooled in 192 sec. (center right). Fig. 22—Sample heated to 876 deg. for 130 min. and cooled in 192 sec. (lower left). Fig. 23—Sample heated to 857 deg. for 130 min. and cooled in 225 sec. (lower right). All samples cooled 850 to 350 deg.; photomicrographs etched in 5 per cent Nital for 5 sec.; 250 diameters, except Fig. 21, which is 100 diameters.

Welding Progress Facilitates Bri

PROGRESS in the development of heavily-coated electrodes has made possible the effective use of welding for strengthening, reconditioning and fabrication of highway and railroad bridges, many of which because of present economic conditions will have to be strengthened rather than replaced. Results of tension, bend, impact, shear and other tests that show the suitability of welding for this work are cited by Mr. Vogel

WELD metal, equal in physical properties to the structural steel used for bridges, can now be deposited by the metallic arc. Such progress is notable, for it indicates a definite transition in the design and technique of welding bridges for railroads and highways. The economic situation in our country is such that many of the bridges for highways and railroads must be strengthened rather than replaced. There is no known method for the strengthening of bridges equal to welding. Reconstruction of highway bridges by welding has been practiced to quite an extent even without the advantages of the newer electrodes. Now that the newer electrodes provide weld metal with properties equal to structural steel, there is nothing to prevent the reconstruction or strengthening of railroad bridges except perfecting the necessary technique in the handling of the electrodes or developing the details of design.

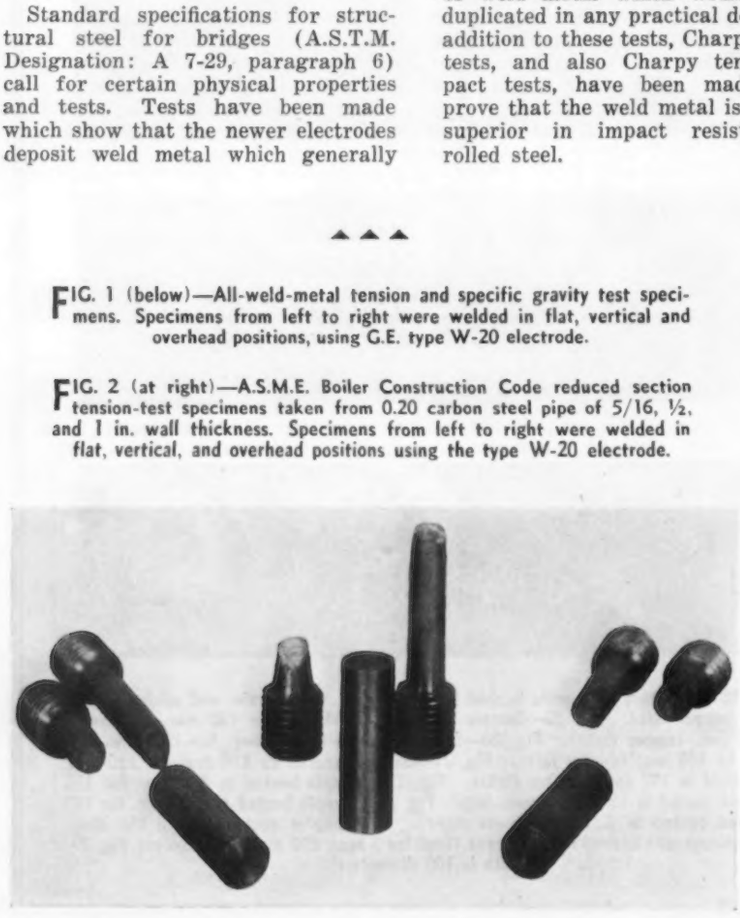
Standard specifications for structural steel for bridges (A.S.T.M. Designation: A 7-29, paragraph 6) call for certain physical properties and tests. Tests have been made which show that the newer electrodes deposit weld metal which generally meets the requirements for tensile strength (55,000-65,000 lb. per sq. in.); yield point (0.5 tensile strength, not less than 30,000 lb. per sq. in); and elongation in 2 in. (22 per cent). Tests have also been made which practically meet the requirements for bend tests. They have not been made for elongation in 8 in. as that would involve the deposit of a large amount of weld metal which would not be duplicated in any practical design. In addition to these tests, Charpy impact tests, and also Charpy tension impact tests, have been made which prove that the weld metal is equal or superior in impact resistance to rolled steel.

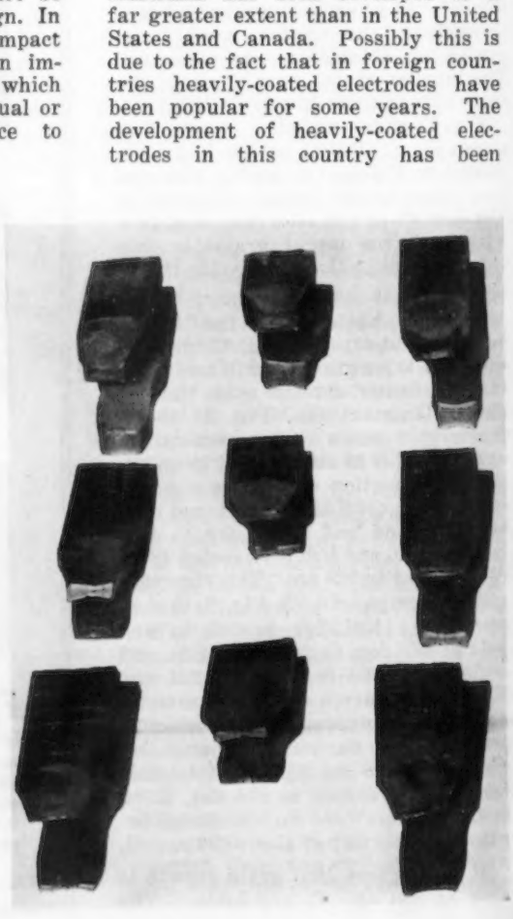
An examination of the "Rules for Construction of Unfired Pressure Vessels, Section VIII, A.S.M.E. Boiler Construction Code," will show that Class 1 welds should meet all of the requirements usually specified for the structural steel for buildings and bridges. An examination of this specification reveals many interesting facts, and particularly the fact that weld metal has now become so dependable that it may be used for pressure vessels of practically all descriptions. Section I on "Power Boilers" of the same Boiler Construction Code calls for the same welding requirements as Class 1 of Section VIII, except all seams are required to be X-rayed. The developments in the welding of power boilers and other pressure vessels have indicated possibilities in the use of welding for bridges and buildings far beyond present practice.

The welding of bridges in Germany, Czechoslovakia, Poland and Australia has been developed to a far greater extent than in the United States and Canada. Possibly this is due to the fact that in foreign countries heavily-coated electrodes have been popular for some years. The development of heavily-coated electrodes in this country has been

FIG. 1 (below)—All-weld-metal tension and specific gravity test specimens. Specimens from left to right were welded in flat, vertical and overhead positions, using G.E. type W-20 electrode.

FIG. 2 (at right)—A.S.M.E. Boiler Construction Code reduced section tension-test specimens taken from 0.20 carbon steel pipe of 5/16, ½, and 1 in. wall thickness. Specimens from left to right were welded in flat, vertical, and overhead positions using the type W-20 electrode.





Bridge Reconstruction and Repair

By ANDREW VOGEL
General Electric Co., Schenectady, N. Y.

caused principally by the requirements of the boiler construction code mentioned above.

Existing Structures Reconditioned

The economic situation has been touched on briefly before. It is reasonable to expect that for the next few years railroads and highway departments must use all existing structures as long as possible. It will be absolutely necessary to recondition or strengthen many bridges. It has been the experience of many engineers that bridges are usually weak at only a few minor points and that the strengthening by drilling for and riveting on additional parts is extremely costly. The newer method consists of cleaning the structure, burning off or otherwise removing paint and rust, and then welding on additional parts.

Fortunately, gas-cutting equipment is now available which will cut out any segments or holes necessary, so that parts can be fitted over the rivet heads. In this way, it is possible to ship bars and structural shapes direct from the mill to the site and fit them to the structures as required, without shop fabrication. If drawings which give the details and dimensions of the various parts are available, such gas cutting or preparation of additional members can be done, of course, in the shop in accordance with the usual routine. If, however, alterations are required or drawings are missing, then it is possible to do the work at the site. In this event, gas-cutting equipment becomes an indispensable tool.

The tests described below follow closely the specifications of the American Society for Testing Materials. The tension specimens parallel in design the specimens described by the A.S.T.M., and the tension test values are uniformly more than 65,000 lb. per sq. in. Yield point is usually not taken for such tests, as yield point is more a measure of the steel bars welded together than of the weld itself. Where yield point is taken, it usually is over 50,000 lb. per sq. in. Elongation in 8 in. is not taken, as elongation over such a long dimension would merely register the elongation in the steel bars welded together and would not show the elongation in the weld metal itself. Elongation in 2 in. is taken on a typical all-weld-metal tension specimen made in accordance with the specifications in Section VIII of the Rules for Construction of Unfired Pressure Vessels of the A.S.M.E. Boiler Construction Code. Class 1 of code requires minimum elongation of 20 per cent in 2 in.

The tabulation following [Table I] gives the results of a group of tests on all-weld-metal tension specimens made in accordance with the A.S.M.E. Boiler Construction Code. The column headed "Position of Welding" indicates whether the weld metal was deposited in the V-shaped grooves between the plates, with the groove in a flat (horizontal), vertical or overhead position.

The A.S.T.M. code calls for a minimum elongation of 22 per cent in 2 in., while the A.S.M.E. code calls for a minimum elongation of 20 per cent in 2 in. These specimens met the requirements of the A.S.M.E. code and practically met those of the A.S.T.M. code with respect to elongation in 2 in. On the other items, the all-weld-metal tests, using W-20 electrodes, more than fulfilled the requirements of either code.

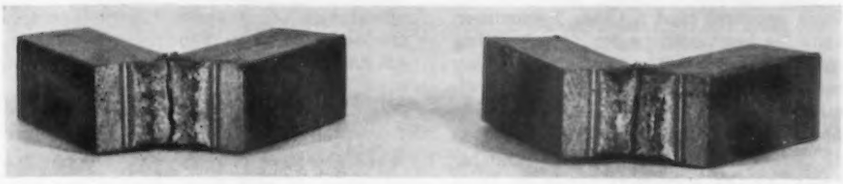


FIG. 3 (at right) — A.S.M.E. Boiler Construction Code free bend test specimens taken from 0.20 carbon steel pipe of 5/16, ½, and 1 in. wall thicknesses. Specimens from left to right were welded in flat, vertical, and overhead positions using the type W-20 electrode.

FIG. 4 (above) — All-weld-metal Charpy impact test specimens welded in flat position using G.E. W-20 electrode.

TABLE I—ALL-WELD-METAL TESTS
W-20 ELECTRODES

Position of Welding	Specific Gravity	Reduction of Area	Elongation in 2 in..	Yield Point (lb. sq. in.)	Tensile Strength (lb. sq. in.)
Flat	7.795	38.5	21.5	54,600	75,500
Vertical	7.799	35.8	20.5	50,300	68,500
Vertical	7.797	48.5	21.5	53,000	70,000
Overhead	7.795	42.3	24.0	49,500	65,600
Average	7.7965	41.275	21.875	51,850	69,900

TABLE II—A.S.M.E. STANDARD REDUCED SECTION TENSION TESTS

(Values in lb. per sq. in.)

SPECIMEN	POSITION OF WELDING Flat	Vertical	Overhead
	5/16-IN. PLATE		
CGP	71,500	63,600	57,800
CKP	51,400	64,950	48,300
BIP	67,000	46,550	52,900
BDP	50,400	57,100	50,900
	½-IN. PLATE		
MKP	65,300	63,500	63,200
CGP	65,200	65,000	65,300
CFP	63,350	55,900	62,400
CHP	64,400	71,700	64,450
	1-IN. PLATE		
BDP	53,700	54,300	55,400
XTP	62,750	62,550*	59,050
ABP	63,550	63,750	61,900
BIP	64,600	63,700	64,100*
BP	63,400	57,300*	63,400

All specimens except those marked by the asterisk broke in the plate, well outside the weld. (Required tensile strength of plate 45,000 lb. per sq. in.) *broke in weld and plate.

The A.S.M.E. Boiler Construction Code requires tension tests on welded joints. The specimen is called a reduced-section tension-set specimen. The 5/16-in. specimens were taken from an 8-in. pipe located with its longitudinal axis horizontal. The ½-in. specimens were taken from a 14-in. outside diameter pipe with its longitudinal axis horizontal. The 1-in. specimens were taken from 1-in. plates rolled up to 14-in. outside diameter to simulate pipe joints in normal position with longitudinal axis horizontal. Strips were cut from the pipe joints. Those designated as "flat" were taken from the top of the pipe, those designated as "vertical" from the sides—that is, at the horizontal diameter—and those marked "overhead" from the bottom of the pipe. Specimens so taken are more truly indicative of the quality of welds which can be produced by the welder using W-20 electrodes in the awkward positions involved in welding around a pipe.

The tabulation [Table II] shows that all welds broke in the plate stock well outside of the welds, with the exception of three specimens. These specimens failed in the weld at 57,300, 62,550, and 64,100 lb. per sq. in. respectively. They therefore met the requirements of the A.S.T.M. code and the A.S.M.E. Boiler Construction Code. It will be noted that some of the test values are lower than 55,000 lb. per sq. in. This was due to failure in the plate of the lap-welded steel pipe, which is only required to have a tensile strength of 45,000 lb. per sq. in.

Meet Severe Bend Tests

Bend tests are shown for steel plates 5/16, ½, and 1-in. thick welded together with the new heavily-coated electrodes. The plates are shown bent practically flat on themselves, with the weld metal sustaining maximum elongation on the outer surface of the bend. These bend tests follow paragraph 8 of the A.S.T.M. Specifications for Structural Steel for Bridges as nearly as practicable, but were made to comply with the A.S.M.E. Boiler Construction Code.

Table III, entitled "A.S.M.E. Standard Free Bend Tests," was prepared from tests made on specimens taken from pipe, as mentioned. The 5/16-in. specimens were taken from 8-in. pipe, the ½-in. specimens were taken from 14-in. outside diameter pipe, and the 1-in. specimens were taken from plate rolled up to 14-in. outside diameter. The flat, vertical and overhead designations indicate specimens taken from top, side and bottom of a pipe with its longitudinal axis horizontal.

The A.S.M.E. Boiler Construction Code requires that a Class 1 specimen shall be bent cold under free bending conditions until the least elongation measured within or across approximately the entire weld on the outside fibres of the bend test specimens is 30 per cent. This is a severe requirement, as the specimen tends to bend outside the weld, thus making it exceedingly difficult to bend the weld itself. The tabulation shows that even this drastic test can be met by many specimens.

Charpy Tension Impact Tests

The next series of tests was made on the standard Charpy impact test specimens, and show the ability of the weld metal to resist impact. The average values of Charpy impact tests vary between 15 and 30 ft.-lb. for structural steel. Tests on weld metal deposited by the W-20 electrode varied from 24.4 to 27.9 ft.-lb.

TABLE III—A.S.M.E. STANDARD FREE BEND TESTS

(Values in per cent elongation of outer fibre)

SPECIMEN	POSITION OF WELDING Flat	Vertical	Overhead	Average
		5/16-IN. PLATE		
CGP	26.7	28.8	29.9	
CKP	...	27.0	44.0	
BIP	36.0	30.0	38.0	
BDP	25.0	27.0	31.0	
Average	29.2	28.2	35.7	31.03
		½-IN. PLATE		
MKP	41.0	31.3	32.0	
CGP	35.5	35.5	34.2	
CFP	36.0	36.0	38.3	
CHP	30.0	26.0	35.5	
Average	35.6	32.2	35.0	34.27
		1-IN. PLATE		
BDX	31.0	35.0	30.9	
	30.7	29.5	30.0	
ABP	25.8	29.6	24.4	
BIP	23.9	21.5	20.6	
BP	29.1	26.5	28.9	
Average	28.1	28.4	27.0	27.83
			General Average	31.04

This is, therefore, an immediate and direct comparison between weld metal and rolled steel with respect to impact, and the values obtained from the weld metal compare favorably with rolled steel.

In addition to the standard Charpy impact test specimens, Charpy tension impact tests [Table IV] were made on specimens using three types of electrodes. The first type is a standard sul-coated rod extensively used on steel frames for buildings and is identified as G-E type L; the other two, known as G-E types W-20 and W-21, are heavily coated. The tests, wherever failure occurred in the plate stock, illustrate the fact that the weld metal is generally superior in impact to the plates that are welded together.

These test results were made available through the courtesy of Col. G. F. Jenks, Watertown Arsenal, Watertown, Mass., and the photographs and data are well worth consideration as demonstrating a new form of comparative impact test. The superiority of this type of impact test over the standard notch bar test lies in the fact that the entire welded joint is tested, rather than a small specimen from the weld metal itself.

Nick Break Test Shows Weld Quality

Another form of test is that known as the nick break test. This can be simply and inexpensively performed. It shows the quality of weld metal laid down by the welder in as simple and direct a manner as possible. If any defects occur, due to errors in the technique of the welder, this particular specimen will expose the defects immediately and give the welder an opportunity to improve his methods. This test can be made at the site. It only involves welding together two plates, as shown in the illustration, cutting the specimen into strips with a gas torch, making a nick with the gas torch, supporting the specimen, and then striking the specimen a heavy blow. The fracture is easily interpreted in terms of satisfactory or unsatisfactory weld metal as to porosity or with respect to defects resulting from failure to remove slag or other foreign material.

Specimens can also be made in accordance with Fig. U-13 of the A.S.M.E. Boiler Construction Code, Section VIII; but, while the external appearance is more satisfactory than

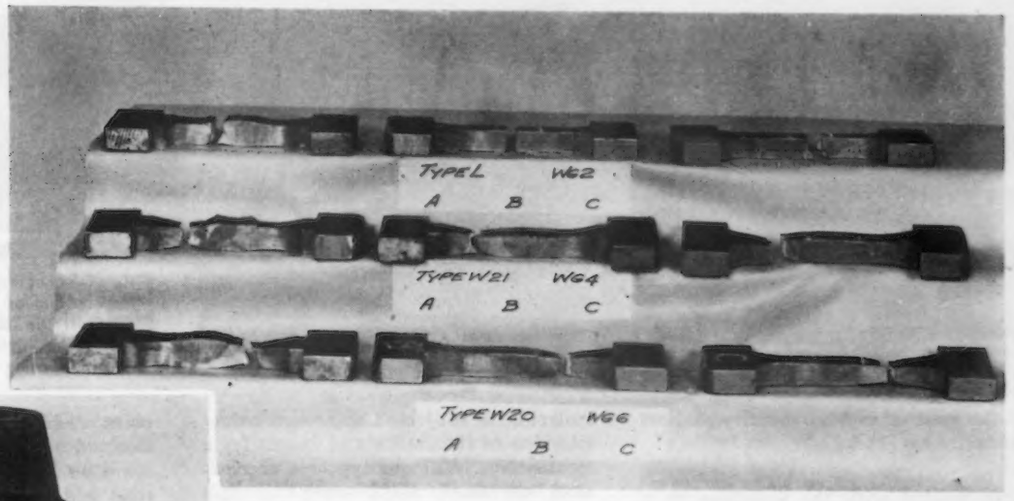


FIG. 5 (at right) — Charpy tension impact test specimens using low-carbon steel plates. They were welded in flat position using G.E. Types L, W-21, and W-20 electrodes.

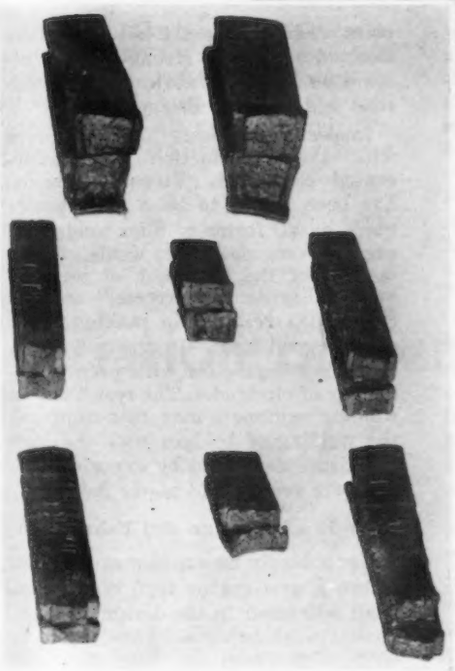
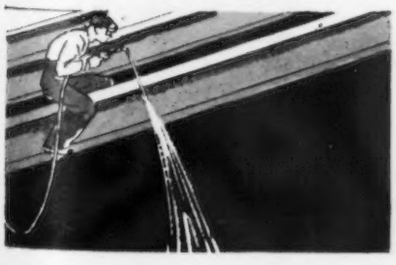


FIG. 6 (at left) — A.S.M.E. Boiler Construction Code nick break test specimens taken from 0.20 carbon steel pipe of 5/16, ½, and 1 in. wall thicknesses. Specimens from left to right of 5/16 and ½ in. groups were welded in flat, vertical and overhead positions; and specimens in 1 in. group were welded in flat and vertical positions, using the type W-20 electrode.

specimens prepared by the gas torch, the results are the same.

Shear Tests of Welds Made With Heavily-Coated Electrodes

Shear tests are, of course, very important tests of this type of weld metal. Practically all structures are designed so that the weld metal is in shear. Many hundreds of tests have been made to determine the shear value of fillet welds, using ordinary bare or lightly-coated electrodes. One hundred seventy-three tests were reported in the *General Electric Review* of June, 1929, pages 332-340. It is now desirable to parallel this series, using heavily-coated electrodes. Tests already made indicate that the shear value, when heavily- coated electrodes are used, is about the same as, or slightly higher than, for bare or lightly-coated electrodes. It is necessary, when heavily-coated electrodes are used, to be sure that penetration has taken place at the root of the weld.



The tabulation entitled "Longitudinal Shear Fillet Weld Tests" [Table V] was based on a group of tests made in accordance with the specimen designated as Fig. 54, page 109, in the report of the Structural Steel Welding Committee of the American Bureau of Welding. This report was issued in September, 1931, by the American Welding Society, New York.

It will be observed that the tabulation indicates three groups of specimens. The first three specimens were welded in such manner as to produce 3/8-in. fillet welds in two passes. The first pass consisted of 5/32-in. W-20 electrodes, a current of 170 amp. being used. This pass was applied rapidly, securing deep penetration at the root of the weld, but building up only a small fillet. The second pass was made by 3/16-in. W-20 electrodes, 220 amp. being used. This pass completed the weld to a 3/8-in. fillet, and also refined the first pass.

The specimens in the second group were welded with a single pass using 3/16-in. W-20 electrodes at 220 amp.

Those in the third group were welded with two passes, in each case 3/16-in. W-20 electrodes at 220 amp. being used. This third group of specimens was rotated so that the surface

TABLE IV—CHARPY TENSION IMPACT TESTS
(Tested at Watertown Arsenal)

Specimen	Electrode	Ft.-Lb.	Failure
WG-2 A	L	259.98*	Weld, in fusion zone
B	L	393.5	Center of weld
C	L	459.6	Center of weld
WG-4 A	W-21	1082.6*	Plate
B	W-21	1260.0	Plate
C	W-21	1250.2	Plate
WG-6 A	W-20	758.7*	Plate
B	W-20	934.0	Plate
C	W-20	1003.1	Plate

*Reinforcement left on.

The above specimens were butt welds in ½-in plate. The width of the specimen at its narrowest section was ⅝ in.

WELDING CONDITIONS

Specimen	Plate	Bevel	Space	Electrode	Amps.	Arc Volts	No. Passes
WG-2	½ in.	Std. V	0	3/16 in. L	180	18–20	3
WG-4	½ in.	Std. V	0	1/4 in. W21	260	35–38	3
WG-6	½ in.	Std. V	0	3/16 in. W20	180	21	3

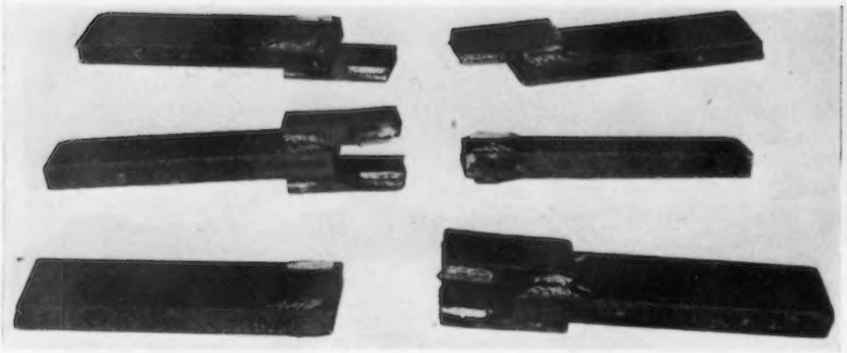


FIG. 7—Longitudinal shear fillet weld test specimens made according to Fig. 54, report of A.B.W. Structural Steel Welding Committee. Welding was in flat position, using G.E. W-20 electrode.

of the pool of molten metal was horizontal.

The first two groups of specimens were welded with the specimen in a flat position, thus simulating normal position most frequently encountered on structures and bridges. The test values show that they failed almost uniformly at 12,000 lb. per linear inch or more. The one exception failed at 11,950 lb. per linear inch.

The uniformity of the results is impressive. It brings out the fact that heavily-coated electrodes can produce as uniform strength as bare or lightly-coated electrodes.

The test results of the latter were so uniform as to be particularly emphasized on page 340 in the article on "Tests of Metal Arc Welds" in the June, 1929, *General Electric Review*.

Table V should be studied in conjunction with Figs. 7 and 8. From these data, it will be observed that two groups of tests were made with two-pass welds and one group with a single-pass weld. Fig. 7 shows specimens W-12-1, -2, and -3, made with two-pass welds, after being tested, and the fractures indicate the high quality of the weld metal.

While specimens W-12-4, -5, and -6, made with single-pass welds, showed shear test values equal to the other specimens, tests made by bending bars perpendicular to the weld, as illustrated in Fig. 8, indicated that greater ductility is obtained in two-pass welds, by virtue of the refinement of the metal in the first pass.

The specimens illustrated in Fig. 8 were welded on one side only. The specimen on the left was made with a two-pass weld and the strips were bent downward by hammer blows as shown. The specimen on the right was made with a single-pass weld and the strips were bent down only part way when the weld fractured. These bend tests are confirmed and explained by photomicrographs, which show the refinement of the first pass, resulting from the application of the second pass. It appears, therefore, that these tests should lead to the conclusion that two-pass welding is preferable to single-pass welding.

The steel work of a railroad bridge, and of a highway bridge crossing a railroad, is subjected to severe corrosion due to the smoke and fumes from locomotives. Various types of accelerated corrosion tests, such as salt spray, weatherometer, and immersion in equal parts of hydrochloric acid and water, show that welds made with bare electrodes corrode faster than welds made with heavily-coated electrodes, such as the type W-20. Immersion in acid solutions and salt spray tests are well known, but the weatherometer test is not so generally known.

The weatherometer is a device in which the specimen is subjected to ultra-violet rays continuously and to a spray of water alternately on and off for 15-min. periods. All these tests indicate that, while weld deposits made with bare electrodes corrode at a slightly more rapid rate than structural steel, welds made with heavily-coated electrodes corrode at either the same or a slower rate than structural steel. Based on accelerated corrosion tests it appears that welds on bridges, subjected to severe corrosion producing conditions, should be made with heavily-coated electrodes.

Inspection Methods Improved

With tests of various types indicating that the weld metal produced by heavily-coated electrodes is superior in all respects to that of other types of electrodes, and also equal to that of structural steel, we are now at the point where it is possible to use these electrodes for the strengthening, reconditioning and fabrication of railroad and highway bridges.

Inspection methods have improved with the introduction of heavily-coated electrodes. Visual inspection has been found to be a satisfactory guide on all forms of fillet welds, and even on very deep butt welds. Development of the technique of welding, or "qualifying the process," as it is called, has resulted in making every weld a good weld. Progress in technique has kept pace with progress in quality of electrodes. The result is that welding engineers may now approach the welding of bridges with the high confidence developed by experience on pressure vessels and power boilers.

New Era In Design and Fabrication

Undoubtedly we are now at the point where a new era or type of development will occur in the design and construction of bridges. This seems to have commenced in European and other countries to a far greater extent than in the United States, probably because European engineers have always been more economical in the use of metal. Material has always been cheap, and labor expensive, in America, while exactly the reverse has been true in Eurpoe. Conditions in the relative cost of metal to labor are now changing in the United States. Eco-

TABLE V—LONGITUDINAL SHEAR FILLET WELD TESTS

See Figure 54, Page 109, of "Report of Structural Steel Welding Committee of the American Bureau of Welding," issued Sept., 1931

Specimen	Welding Procedure	Inches of Weld at Failure	Total lb., at Failure	Failure in lb./linear inch
W-12-1	2 passes	6.500	79,400	12,200
2	1st 5/32 in. W-20-170-A	6.500	80,800	12,400
3	2nd 3/16 in. W-20-220-A	6.562	80,250	12,200
W-12-4	1 pass	6.250	75,800	12,100
5	3/16 in. W-20	6.250	78,650	12,600
6	220-A	6.125	75,350	12,300
W-12-7	2 passes	6.312	75,650	11,950
8	3/16 in. W-20 220-A	6.062	81,350	13,350
9	45 deg. angle	6.312	83,150	13,150

FIG. 8—Specimens showing difference in ductility between ⅜ in. fillet welds made with one and two passes. One at left shows bend tests on two-pass weld; the other fracture from bend test on single pass weld.

nomic factors have also made it necessary to extend the life of bridges and structures as much as possible because of the financial condition of the railroads and of all governmental divisions. These tests should be considered with the thought that they start a new era in design and fabrication, and that, therefore, structural and bridge engineers should investigate the possibilities of strengthening or reconditioning structures and bridges by the use of heavily-coated electrodes.

The writer wishes to acknowledge the valuable assistance of J. E. Waugh of the General Electric Co., who furnished the test data and photographs for this article.

Relation of Temper Colors to Temperatures

By T. N. HOLDEN
Secretary, New York Chapter, American Society for Steel Treating

THE following may throw some light on the debatable question as to the relation of tempering colors to temperature. That is, whether the temper colors represent the actual condition (not the temperature) of the steel itself. Some tool makers maintain that the efficiency of the tool, both in hardness and other properties, is the same whether the color has been obtained by a short heating at a high temperature or a longer heating at a lower temperature, and that the ultimate results are indicated by the temper colors, independent of the method of obtaining them. Others aver that this is not the case. I disagree with the former and contend that temperature, regardless of color, is the only true indication of good tempering and I believe the following will prove that temper colors are at best but a surface indication.

If a polished strip of steel or iron is heated strongly at one end, the other end remaining cold, there is produced over the heated portion a layer of oxide scale, the thickness of which diminishes gradually with the distance from the hot end. Somewhere in the center of the strip the thickness of the oxidized layer will become comparable to the wave length of light and over this section the films give rise to a series of interference tints commonly known as "temper colors."

The colors are the result of the fact that two trains of light waves are reflected respectively from the outer and inner surfaces of the oxide film. As there is interference between the crests of some of the waves with the troughs of some of the others, there is produced a variance of colors, ranging from a light yellow at the thinnest coating of the oxide to a blue at the thickest portion. Below a certain thickness of oxide, no colors are produced since the oxide film is so thin as to produce wave lengths so short as not to affect the eye.

It is easy to comprehend, from the foregoing, the necessity for having a polished or bright surface in order to obtain the colors, as it is essential that there be some reflecting medium; and also that the various tints produced are not the color of the oxide, which is more or less a dark gray or black, but are caused by the steel reflecting different colors as the thickness of the oxide increases from the color of the steel itself to a blue and, when very thick, a black.

The longer the strip is allowed to be exposed to heat, the thicker the oxide will become, the non-visible oxide becoming yellow; the brown, blue; and so on, and finally the heated portion might be coated with a black oxide depending on the temperature to which the strip is exposed. Another case in point is that, with a correct amount of oxygen present, the colors would form quickly and that, with too little oxygen present, the color might not form at all or take a longer time than usual.

From the foregoing one can better understand how time and temperature have a marked effect on the temper colors and one can readily see why that tempering at a certain temperature for a given length of time would be much better than to just draw to a straw or brown or blue as the case might be. While the colors are a guide to tempering there are certain conditions that may tend to vary the colors regardless of the temperature employed such as time and atmosphere. Also temper colors are only surface indications and not criteria of the whole body of the tool or die.

The Heat Treatment of Cast Iron

By CARL H. MORKEN
Foundry Engineer, Detroit Electric Furnace Co.

ORIGINALLY, a more extended use of cast iron was only brought about because of the low price and ease with which it conformed to pattern when cast. Recently, the metallurgist turned to cast iron as a material which was worthy of his research, and the result was a greatly improved metal which conformed to the rigid specifications of design engineers. This manuscript is a resume and examination of heat treatments which result in particularly high strength cast irons of unusual ductility, shock resistance and fatigue strength. Future applications are indicated. Mr. Morken will present this paper at the Detroit meeting of the A.S.S.T.

BECAUSE of its humble origin and homely methods of production, cast iron has for generations been considered an inferior material and was held to be quite unsuitable where strength, ductility, and shock resistance were necessary. It occupied an obscure position during a period of tremendous metallurgical development in other fields. During only the last few years, cast iron has begun to receive attention as an alloy capable of refinement and worthy of intensive study. Improved metal from the electric melting furnace awakened in the metallurgist a new interest in cast iron as an engineering material, and as the metallurgist became able to produce better irons, the engineer began adopting them as materials worthy of his use.

Use of the electric furnace resulted in cast iron which possessed more than four times the strength of the conventional "old" cast iron, and in addition iron of greatly improved shock-resistant properties. During the last two years a number of startling and revolutionary applications of heat treated cast iron have been made and others, still more startling, are in the process of development.

Heat Treatment of Gray Iron

In considering the heat treatments applicable to cast iron the first type to be examined will be ordinary gray iron. The gray appearance of the fracture is caused, of course, by free graphite, and the matrix may be composed of pearlite, pearlite and ferrite, or pearlite, ferrite and cementite, with other minor constituents present. The gray iron foundryman has learned that the ideal is an iron, similar to that illustrated by Fig. 1, in which the matrix is pearlite, and the graphite is of individually fine particles, uniformly distributed through the matrix. This iron contained 2.70 per cent total carbon, 1.70 per cent silicon and had an unalloyed tensile strength of 52,210 pounds per square inch. His attempts to produce such iron are frequently frustrated by unforeseen or uncontrollable foundry conditions, and free ferrite results, to the detriment of hardness and wear resistance, or free cementite is obtained, much to the detriment of machinability. In many instances, due to the design of castings, stresses are set up in the casting as the metal freezes. Since the ultimate value of any casting is equal to the theoretical strength less the internal stresses, it

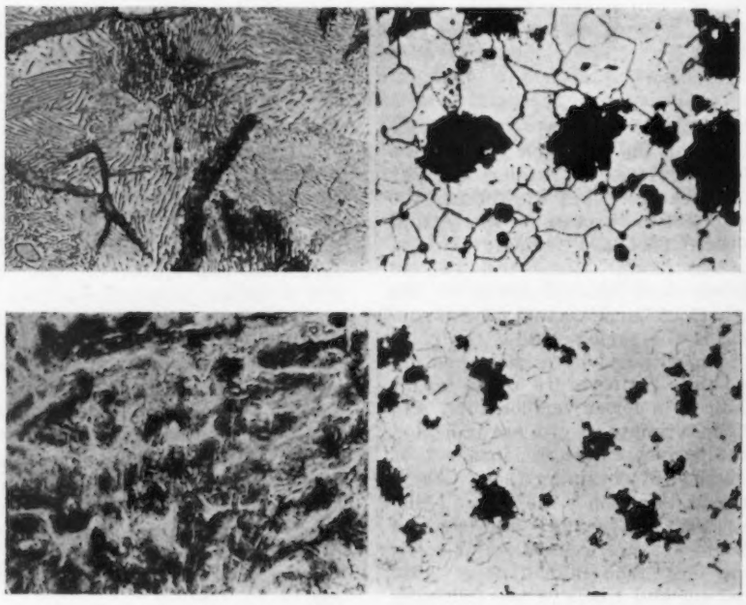


FIG. 1 (upper left)—Pearlitic gray cast iron produced in rocking indirect arc electric furnace. Etched, 100 diameters. Fig. 2 (upper right)—Air furnace malleable iron made by standard long cycle anneal, 140 hr. Note large graphite particles and equally large average grain size. Etched, 100 diameters. Fig. 3 (lower left)—White iron melted in indirect arc rocking electric furnace. Note relatively large proportion of pearlite to cementite and the manner in which the free cementite has been broken up and distributed. No primary graphite is present. Etched, 100 diameters. Fig. 4 (lower right)—Same iron as Fig. 3 but annealed with 20-hr. cycle, having fine graphite nodules, uniformly distributed and fine grain size. Note absence of pearlite. Etched, 100 diameters.

is desirable to remove those internal stresses created during the freezing.

The stress removal is accomplished by a simple heat treatment frequently referred to as "normalizing" or "aging." The castings are heated to a point ranging from 800 to 1100 deg. F. (430 to 595 deg. C.), and maintained at maximum temperature until equilibrium is reached. An ordinary treatment for relief of internal stresses consists of holding for four hours at 900 deg. F., and, when properly conducted, such treatment has no apparent effect upon the physical properties of the castings. Because of the graphitizing tendency of silicon, it is advisable to use low temperatures for relieving stresses in high silicon irons, and, per contra, higher temperatures are permissible for a low silicon content.

A second heat treatment for gray cast iron is the anneal, used to break down the free cementite so that rough castings may be more readily machined. The treatment consists mainly of heating above the critical temperature and cooling slowly to a temperature well below the critical, followed by dumping the charge into the air for convenience in handling. The general treatment consists of holding at a point from 1400 to 1650 deg. F. for

two to six hours and cooling in the furnace to black heat. The brief soak above the critical temperature serves to decompose the free cementite without seriously affecting the eutectoid cementite. Slow cooling through the critical range facilitates this decomposition. The annealing, as outlined, decreases the hardness and causes a reduction in the physical strength of the iron. The reductions in hardness and strength are variable, depending upon temperature, time, and the composition of the iron. The ideal treatment is that in which the hardness is decreased only enough to produce the desired machinability.

A third treatment is a hardening, which is frequently called "martensitic quench," and it may or may not be followed by a draw. The object of the quenching is to produce extreme hardness, to increase hardness while retaining machinability, or to increase the strength of the iron. The casting is quenched from above the critical temperature. One limitation that immediately suggests itself is the formation of quenching cracks, but these are obviated by: (1) selection of quenching medium, (2) correct design of heating and quenching cycle, (3) redesign of the casting, and (4) use of alloys to increase the hot strength of the iron or to lower its critical temperature, whereupon lower quenching temperatures are used.

Since the critical temperature of cast iron varies with the carbon and silicon content and with alloys, it is common practice to quench from 1450 to 1550 deg. F., which is well above the critical. The quenching medium is determined largely by the design of the casting and the hardness desired, and is usually either oil or air, although water is sometimes used.

By means of the quenching treatment, unalloyed cast iron with a Brinell hardness of about 400 is readily obtained, while the hardness of alloyed metal runs up to 500 or more. These irons are used for withstanding severe wear and abrasion, and are not commercially machinable.

Ballay[1] has described a quenching treatment in which good hardness is obtained with machinability. He quenches in oil from about 1500 deg. F., and draws at from 400 deg. F. and 600 deg. F. to relieve quenching stresses. Nickel is used in the iron to improve susceptibility to heat treatment and to lower the critical temperature. The iron is machinable and has a martensitic structure. Brinell hardness is about 350.

As with steel, cast iron is frequently machined in the "as-cast" condition, following which it is quenched, drawn and the machining completed at slow speed or by grinding. The strength of gray cast iron is increased by quenching and drawing, and strength values well over 85,000 lb. per sq. in. are readily obtained with a fair degree of machinability.

[1] Marcel Ballay, *Transactions*, American Foundrymen's Association, Vol. XL, 1932, p. 1.

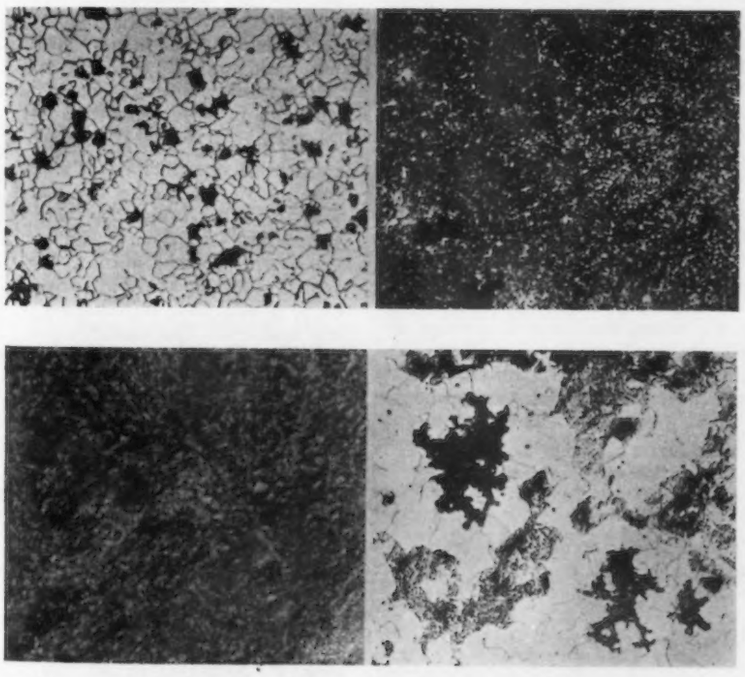


FIG. 5 (upper left)—Iron similar to Fig. 4, annealed with 24-hr. cycle. No pearlite remains. Etched, 125 diameters. Fig. 6 (upper right)—Same iron as Fig. 5, but heat treated to produce high strength with total cycle of 8 hr. Etched, 125 diameters. Fig. 7 (lower left)—Same iron as Figs. 3 and 4, but given heat treatment for high strength. Properties illustrated by Fig. 9. Etched, 100 diameters. Fig. 8 (lower right)—Showing retention of pearlite. The white iron, similar to Fig. 3, was electrically melted and the total annealing cycle was about 15 hr. Etched, 100 diameters.

White Iron

As its name indicates, white iron is iron of such composition as to produce a white fracture. All the carbon is combined and no graphite exists in the iron as cast.

White iron has been produced for years for abrasion resistant parts and for making malleable iron, but it has limited commercial application. Since white iron is brittle, it sometimes is found necessary to anneal it slightly in order to preclude breakage of the castings in handling. This anneal consists, usually, of holding at 1500 to 1600 deg. F. for three to four hours, which precipitates a small amount of graphite and breaks down some of the massive cementite, thereby increasing the toughness of the castings.

Most white iron poured is converted into malleable iron or some

form similar to malleable iron. Rapid strides have been made during the last year in this field, with attention directed primarily toward shortening the annealing cycle and improving the physical properties of the iron. This activity has developed a series of irons with distinctly new properties.

Malleable Iron

Malleable iron is produced from white cast iron by a suitable annealing process. Schwartz[2] has made this type of iron the subject of a most comprehensive treatment. White iron is primarily an alloy of iron, carbon, and silicon, containing small amounts of other elements. The carbon is entirely combined and no graphite exists, and the structure consists mainly of massive cementite and pearlite. In producing malleable iron from this material, the combined carbon is completely broken down, and the carbon precipitated as graphite in a matrix of ferrite. Since the graphite is very gradually liberated, and since it is liberated at high temperature in solid iron, it assumes a characteristic form, collected in nodules composed of extremely fine individual particles. This graphite is called temper carbon or secondary graphite. Fig. 2 illustrates the structure of malleable iron.

Annealing Stages

Malleable iron is produced from white iron by an annealing process composed of two stages. The first stage consists of heating at a temperature well above the critical (Ac_1) until the massive cementite has been destroyed. The temperature used commercially ranges from 1600 to 1700 deg. F., and when equilibrium has been reached at this temperature, the structure consists of graphite and solid solution of carbon in iron.

Since the solubility of carbon decreases as temperature decreases, carbon will continue to precipitate as the temperature is lowered. When equilibrium is reached at a temperature just above the critical point, the structure is composed of temper carbon in pearlite.

The second stage of annealing consists of holding at a temperature just below the critical point (Ar_1) to destroy the pearlite. Carbon continues to precipitate, at the expense of pearlite, and ferrite forms. The temperature used ranges from 1300 to 1350 deg. F., and when equilibrium is reached, the structure is composed of temper carbon in a matrix of ferrite.

The silicon, previously referred to, greatly accelerates this graphitizing process. Silicon is a vigorous graphitizing agent and the malleable foundryman wishes to use as much of it as he can in his iron. He is limited with ordinary melting equipment, however, because, when the silicon is too high, some of the carbon will precipitate out as graphite as the white iron freezes. This graphite, known as primary graphite, is in the form of coarse flakes and deprives malleable iron of strength and ductility.

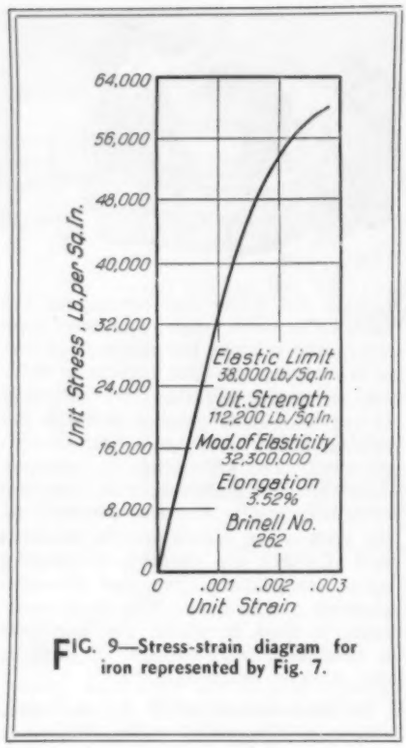


FIG. 9—Stress-strain diagram for iron represented by Fig. 7.

In commercial malleable practice, the two stages of annealing merge into one another so closely that a distinction is not obvious. After the first stage is completed, the temperature is allowed to drop slowly (10 to 15 F. deg. per hr.) to about 1200 deg. F., when the oven is opened to accelerate cooling for handling. A typical cycle for producing malleable iron in periodic or batch type annealers is as follows:

(1) Heat to 1650 deg. F. 20 hr.
(2) Hold at 1650 deg. F. 50 hr.
(3) Cool to 1250 deg. F. 70 hr.
(4) Cool for handling.

The properties of malleable iron are greatly dependent upon the composition of white iron used. This composition, however, has become fairly well standardized for air furnace melting practice, and a typical analysis would be, 2.40 carbon, 1.10 silicon, 0.15 phosphorus, 0.05 sulphur, and 0.25 manganese. Malleable iron, when annealed by the above cycle, can be expected to result in the following physical properties:

Ultimate tensile strength—50-60,000 lb. per sq. in.
Yield point—30-40,000 lb. per sq. in.
Elongation in 2 in.—15-20 per cent
Impact strength, Charpy—7-10 ft.-lb.

Short Annealing Cycles

Much attention has been directed toward bringing the commercial annealing cycle closer to the theoretical.

Highriter[3] summarizes this procedure very well. Since the tunnel or kiln type of continuous annealer is more controllable than is the periodic, some reduction of annealing time has been made. The tunnel type permits a rapid cooling to the Ar_1, where an arrest is made and the temperature held at 1300 deg. F. for a sufficient time to complete graphitization.

Attempts to shorten the cycle by changing the composition of the iron (increasing the silicon for its graphitizing action) or by the addition of other graphitizing alloys, have not met with great success, because of the difficulty in preventing primary graphite.

Valentine[4] worked on a different angle and succeeded in shortening the cycle to 30 hours, through the use of an electric annealer, in which time and temperature reactions are closely controlled. Valentine found that manipulation of temperatures, particularly in range of the Ar_1, increased the rate of graphitization.

The process consists mainly of establishing equilibrium at a temperature above the Ac_1 in the usual manner, following which the temperature is manipulated during the cooling to the lower critical point. One major reason for the short duration of this cycle is complete elimination of packing material. The castings are simply piled up on cars and the cars elevated into the annealer. To facilitate the operation, two ovens are used, one for high and one for low temperature. This arrangement permits an air quench during the transfer and, further, conserves heat. The process is said to be thoroughly economical and metallurgically satisfactory.

White and Schneidewind[5] investigated the influence of superheating the molten white iron. They found that white iron superheated to 3200 deg. F. annealed in 40 per cent of the time required to anneal iron superheated to 2800 deg F. These irons were prepared in electric furnaces, and it is probable that temperature is not alone responsible for the results obtained. It is rather apparent from Figs. 3, 4 and 5 that thorough mixing of the iron, simul-

[2] H. A. Schwartz, "American Malleable Cast Iron."

[3] H. W. Highriter, *Transactions*, American Foundrymen's Association, Vol. XL, 1932, p. 72.

[4] I. R. Valentine, *The Foundry*, Vol. 57, Oct. 1, 1929, p. 825.

[5] A. E. White & R. Schneidewind, American Foundrymen's Association, June, 1933.

taneous with superheating, distributes the free cementite in such a way as to provide several graphitization centers where only one exists in ordinary white iron. It is also probable that melting and superheating the iron under deoxidizing influences affects the annealing time favorably.

Further, the advantages of superheated, electrically melted, white iron have combined with another phenomenon to reduce further the annealing cycle, and to produce, with extremely short heat treatments, a series of irons related to malleable, but possessing far greater strength. This phenomenon is the ability of white iron, melted under reducing conditions in the rocking indirect furnace, to contain abnormally high quantities of silicon without the formation of primary graphite. Several foundries have been able to reduce the annealing cycle to 20 hr. by such a process.

Fig. 3 is typical of white iron produced in the above manner. It is free from primary graphite and the massive cementite is uniformly distributed through the pearlite matrix. The iron generally contains less free cementite than do other types of white iron. A typical composition of white iron used in this process for sections up to ½ in. thick is, 2.40 carbon, 1.65 silicon, 0.05 sulphur, 0.05 phosphorus, and 0.25 manganese. A typical annealing cycle for lots ranging from 1500 lb. to five tons would be:

(1) Heat to 1750 deg. F. 3 hr.
(2) Hold at 1750 deg. F. 4 hr.
(3) Cool to 1250 deg. F. 14 hr.

The physical properties resulting from the cycle are:

Ultimate tensile strength—60,000 lb. per sq. in.
Yield point—40,000 lb. per sq. in.
Elongation in 2 in.—15 per cent.
Impact strength, Charpy—7 ft.-lb.
Brinell hardness—150.

Other cycles for annealing this white iron are in use in which the temperature is arrested at or near the lower critical, usually at 1350 deg. F. This permits of much more rapid cooling from the high temperature of the first stage of graphitization, but, since the temperature is held at the lower point for from 10 to 12 hr., no time is saved.

Figs. 4 and 5 illustrate the structure of representative malleable irons made in the above described manner. In comparing these to Fig. 2, the difference in grain size and in the size of the carbon particles is outstanding. It is readily apparent that when decomposition of the cementite began, graphite nuclei were formed at close intervals. Therefore, as graphitization progressed, the carbon had only short distances to travel to reach nuclei upon which to precipitate.

Many heat treatments are applied to white iron that has been produced by the electric melting furnace process just described. These treatments all start by holding the castings at high temperature to decompose the

free cementite, as in all malleable processes. To accomplish this they are held at 1700 to 1800 deg. F. from two to four hr. Following this, the heat treatment may be varied in countless combinations, developing many products that differ metallurgically from steel only in that they contain temper carbon.

Quenching in oil from this point produces a martensitic structure with strength well over 100,000 lb. per sq. in., but the treatment is severe for castings of other than simple design. Equally good properties are obtained with a less severe air quench, followed by a draw. One effective treatment is as follows:

Hold at 1750 deg. F. for 3 hr.
Air quench to 1400 deg. F.
Oil quench.
Draw at 1350 deg. F. for 1 hr.
Air quench for handling.

Fig. 6 illustrates iron made with this cycle. The physical properties of this type average as follows:

Ultimate tensile strength—100-125,000 lb. per sq. in.
Yield point—85-100,000 lb. per sq. in.
Elongation in 2 in.—3-7 per cent.
Endurance limit—40-50 per cent.
Impact strength, Charpy—5 to 7 ft.-lb.
Modulus of elasticity—30-35,000,000.
Brinell hardness—225-275.

Figs. 7 and 9 illustrate another iron of this type, made with a different heat-treating cycle. The cycle was:

Hold at 1725 deg. F. for 4 hr.
Cool in furnace to 1425 deg. F.—4 hr.
Oil quench.
Draw at 1350 deg. F. for 1 hr.
Air quench for handling.

Various heat treatments intermediate between the complete anneal and the quench-draw treatment just described are also in use for this electrically melted white iron. These are designed to produce, in some cases, a pearlitic or sorbitic matrix and, in other cases, a matrix of pearlite and ferrite. It has been found that the relative proportions of pearlite and ferrite can be controlled with accuracy by the applied heat treatment.

The pearlitic matrix is produced by cooling quickly from the high temperature soak to about 1500 deg. F., where an arrest is made long enough to reach equilibrium. This is followed by an air or oil quench. Since the ductility of such iron is low and the strength is somewhat lower than the high strength material just described, it has not found wide application.

Most producers prefer to arrest at the lower critical point long enough to form some ferrite, thus increasing the ductility. Fig. 8 shows such an iron, produced with the following cycle:

Hold at 1750 deg. F. for 3 hr.
Cool in furnace to 1350 deg. F.
Hold at 1350 deg. F. for 5 hr.
Cool in furnace to 1200 deg. F.
Air quench for handling.

Such material has from 70,000 to 80,000 lb. per sq. in. tensile strength with 6 to 12 per cent elongation.

Another process uses electric annealing furnaces for malleableizing, which is followed by various quenching and drawing treatments. One producer of castings by this process claims 70,000 to 75,000 lb. per sq. in. tensile strength, 50,000 to 55,000 lb. per sq. in. yield point with from 15 to 18 per cent elongation in 2 in. The cycle employed is said to consume about 60 hr. for 5-ton lots. It is divided approximately as follows: 5 hr. to reach soaking temperature, 20 hr. at the high temperature soak followed by air quench to the lower critical where it is held for 25 hr. About 10 hr. additional is required to reach the handling temperature. The iron used is of special composition, and the details have not been made public.

Applications

Many parts which heretofore were made of malleable iron or steel are now being made from heat-treated cast-iron with complete satisfaction. Such parts include underground cable brackets and clamps used in power distribution systems, machinery cams, connecting rods, conveyor chains, dies, gear racks, gears, differential carriers and universal housings for automobiles, and many other similar products. In addition to possessing more than ample shock resistance and elastic limit, these irons are superior to steel in wearing qualities, stress dampening properties, fatigue resistance and machinability.

One very interesting application of heat-treated iron is for street manhole covers. For this application a material of low yield point is not suitable since it permits the cover to bend after which it rattles in its frame as traffic passes over it. When made from gray cast iron the breakage was high because of the sharp heavy impacts of traffic. A heat-treated cast-iron was designed for the job and the weight of the casting reduced from 212 to 172 lb. This material has a high yield point (50,000 lb. per sq. in.) and possesses good impact resistance.

Considerable development work has been done on heat-treated cast-iron cam shafts and crank shafts for automobiles, Diesel engines, etc. Cam shafts of this material are already in use in at least two automobiles, and it is probable that when this is read, at least one automobile will be using heat-treated cast-iron crank shafts.

Bright Annealing and Normalizing in Co

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EVER since that day when Tubal Cain, the father of all those who work in metals, first heated crude charcoal iron in a hand forge and beat it into the traditional swords and plowshares, man has dreamed of the coming of a day when heating of metals could be accomplished without producing a thick layer of surface oxide difficult afterward to remove. Many experimenters have worked on the problem with indifferent success, some utilizing very elaborate set-ups of atmospheric equipment and others attempting to accomplish their results with rapidity of heating and mechanical handling tools. The recent recession in business activity, with the renewed demand for higher quality and lower production cost has again drawn attention to this age-old problem, with the result that much progress has been made during the past few years.

It is the purpose of this article to summarize briefly, some of the methods of achieving bright annealing and normalizing and the possible future applications for the processes.

INSTALLATIONS of controlled-atmosphere electric furnaces, one using dissociated ammonia gas and the other, a continuous furnace, using a partially combusted and treated natural gas or butane, are described in this article. Possible future applications, some of them offering marked advantages, are also discussed; these include normalizing of cold-rolled strip steel, enameling stock, deep-drawing tin plate, steel wire and of welded steel tubing; also annealing of electrical sheets, and the brazing of steel assemblies.

▼▼▼

The first gaseous medium used successfully for the bright annealing or normalizing of steel parts was pure hydrogen. This gas has long been known to be highly reducing and it was natural that workers should first turn their thoughts to its use. Very successful results can be obtained through the use of pure hydrogen gas, but except in the jewelry industry and in certain special applications where the consumption is small and special considerations dictate the use of hydrogen, its use is economically impossible because of its high cost.

Dissociated Ammonia Gas Used in Bright Annealing Strips

A more recent and cheaper medium has been found in the use of dissociated ammonia. This gas, which is produced by cracking or dissociating anhydrous ammonia through subjecting it to an elevated temperature in the presence of a suitable catalyst, has achieved wide popularity for certain types of work. Fig. 1 shows an installation of bell furnaces used for the bright annealing of cold-rolled strip steel in the plant of a prominent eastern manufacturer. In this application it is essential that the material come from the annealing furnace, not only free of oxide, but with the original surface brilliance characteristic of full-finished cold-rolled strip. This desirable result is obtained with a remarkably low consumption of dissociated ammonia. In the furnace illustrated, the material is placed inside a gas-tight hood made of chrome-nickel heat-resisting alloy and sealed therein by means of oil seals. After purging the air from the hood, the charge is heated by means of a bell furnace which is lowered in place over the retort.

During the heating-up period a slow flow of dissociated ammonia gas is passed through the retort, which gas serves to pick up and carry off the hydrocarbon vapors given off by the roll oil on the steel. When the material has reached its annealing temperature, the bell furnace is removed from over the retort and the material and retort are permitted to cool in the open air, still however being protected by the gas. During the cooling cycle, no flow of gas is necessary, it being sufficient merely to maintain a slight positive pressure within the retort for the purpose of excluding air.

Ammonia Cost Ranges from 20c. to 30c. a Ton of Steel

Under these conditions the consumption of ammonia varies from approximately 1 to 1.50 lb. per ton of steel annealed, depending upon the size of the charge, and at a cost of from 20c. to 30c. per ton of product. The type of furnace equipment de-

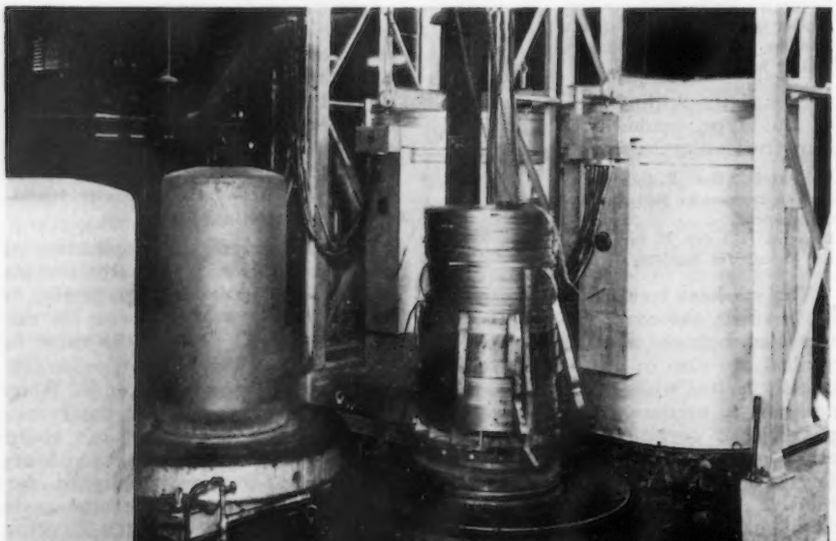


FIG. 1—Bell furnaces used for bright annealing cold-rolled strip steel. During the heating-up period a slow flow of dissociated ammonia gas is passed through the retort; when the material has reached annealing temperature, the bell furnace is removed and the material and retort are permitted to cool in the open air, still protected by the gas, however.

iControlled-Atmosphere Electric Furnaces

By R. R. La PELLE and C. H. CARPENTER
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

scribed above, used in conjunction with dissociated ammonia as an annealing medium, produces the highest quality finish obtainable by any known method, and in general, retains the full surface brilliance present on the steel as it goes to the annealing process.

The equipment shown in Fig. 1 is designed to give the utmost possible temperature uniformity. Not only is the charge completely surrounded by electric heating elements, but a special suspended heater is employed, which supplies heat to the center of the stack of coils. Due to the extremely uniform temperature obtained in these furnaces, re-anneals due to hard coils, lack of uniformity and sticking, have been completely eliminated. Due to the use of dissociated ammonia gas, re-annealing for off-color coils has likewise been eliminated. Investigations made in several plants where conventional batch annealing units have been replaced by bell furnaces reveal overall savings of from $1.50 to $2.50 per ton of product annealed.

Cheaper Gaseous Medium for Continuous Furnaces

For normalizing, however, a continuous-type furnace is necessary. In a continuous furnace, the use of dissociated ammonia gas, in general, is not economical. The reason lies in the fact that continuous furnaces must necessarily have comparatively large openings at both ends; hence the consumption of the atmospheric medium must be relatively high in order to exclude air. To render it economically feasible to make use of such continuous furnaces, therefore, a great deal of effort has been made to discover some cheaper gaseous medium which would still give satisfactory results. Such a medium has been developed by the Westinghouse Electric & Mfg. Co. in the use of partially combusted and treated natural gas or butane. This gas is prepared by the special gas-processing equipment shown in Fig. 2, and provides an entirely satisfactory medium for annealing or normalizing the more common materials.

The cost of the gas produced varies somewhat with the analysis of the raw material used. Employing either natural gas or butane, the cost will vary from approximately 15c. to 30c. per 1000 cu. ft. for the resultant annealing gas. The variation in cost arises principally from the varying characteristics that may be desired in annealing atmosphere. The equipment shown is capable of very simple adjustment to give annealing gas of widely differing analyses and properties; thus the gaseous medium can readily be fitted to the type of material being annealed. The gases can be varied between the following approximate limits:

H_2	4.5-26%
C O	5.5-14.5%
$C O_2$	8.5-2.5%
$C H_4$	up to 7.5%
N_2	81.5-49.5%
O_2	None

Continuous Furnace Application

For handling cold-rolled strip, autobody stock, tin plate, enameling stock or other sheet products, the furnace shown in Fig. 3 has been developed. This furnace consists essentially of a heating chamber provided with an entrance vestibule for minimizing gas losses, and followed by a water-cooled cooling chamber. The conveying means consists of chrome-nickel alloy heat-resisting rollers, which provide a continuous travel for the material into and through the heating and cooling chambers. These rollers are very closely spaced in the heating section in order to prevent sagging of the material being heated. This provision is particularly essential when handling the thinner gages of material. Such a conveyor has the advantage of moving material through the furnace without itself introducing any weight which must be heated and cooled with each passage of the material. For this reason the furnace shown is essentially more economical than the more conventional belt or conveyor type, where a comparatively large amount of tare weight is introduced because of the heating and cooling of the conveyor.

Fig. 4 pictures the discharge end of the furnace, showing the cooling chamber and run-out table. In this furnace the rolls are driven by means

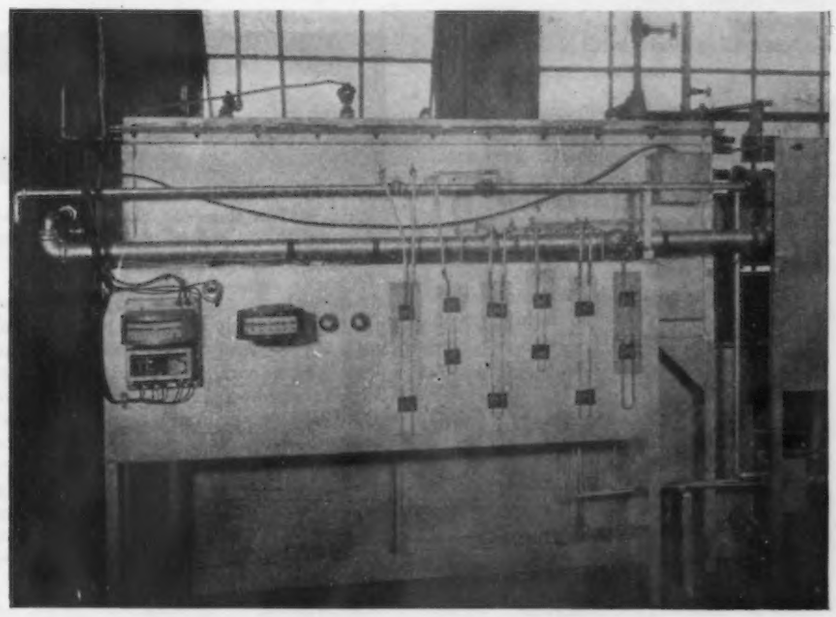


FIG. 2—Gas processing equipment developed to produce a satisfactory and cheaper atmosphere for annealing or normalizing the more common materials. A partially burned and treated natural gas or butane is produced at a cost ranging from 15 to 30c. per 1000 cu. ft.

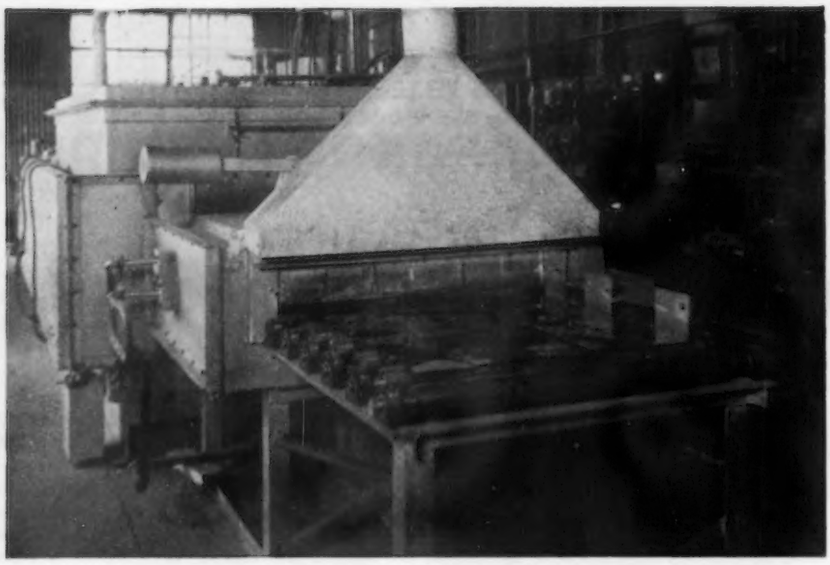


FIG. 3—This furnace for handling strip, tin plate and other sheet products is equipped with heat-resisting rollers which provide continuous travel of the material into and through the heating and cooling chambers.

of a chain drive operating in conjunction with a variable-speed transmission, which makes it possible to obtain any desired heating and cooling time. The gaseous medium is introduced at a number of points throughout the heating and cooling chambers, and air infiltration is prevented by means of suitable baffling arrangements at the ends of the furnace.

For handling products which cannot be conveniently carried upon a roller conveyor, recourse may be had to various kinds of pusher-type furnaces, belt conveyors, etc. Each of these types has its peculiar application, but the general method of applying the gaseous annealing medium is the same in any case.

Normalize Strip with Cold-Rolled Surface

IN attempting to survey the possible fields of application of controlled-atmosphere electric furnaces, no attempt will be made to do more than mention briefly a few of the possible uses. In many of these cases a great deal of material is available, but the scope of the present article, as well as a reasonable consideration for length, prevents it being given more fully.

One of the most prominent possibilities, which was touched on briefly above, lies in the normalizing of cold-rolled steel. This material, at present, is generally box annealed on a rather long cycle, designed to produce a steel of the maximum softness and ductility. Such an anneal is generally done in some type of controlled atmosphere and produces a more or less bright material. There are many drawing operations performed on this cold-rolled material in which the amount of cold working to which the steel is subjected is such as to make it very desirable to have in the steel the so-called "normalized" grain structure prior to drawing. Such a normalized steel has long been used for difficult furniture and auto body stampings because of its excellent deep drawing characteristics. Most present-day normalizers are of the open type, gas fired, and produce a steel having a slightly oxidized surface. This oxide may, if desired, be removed by pickling, but normalized steel cannot, at present, be furnished with the bright, planished surface obtained through cold rolling. The use of the controlled-atmosphere electric normalizing furnace, therefore, makes it possible for steel manufacturers to offer a new product, namely, a cold-rolled steel with its typical surface but with the desirable normalized grain structure. Such a development opens up to the cold-rolled strip manufacturer a sales field from which he was hitherto barred, and at the same time, makes it possible for manufacturers making use of deep-drawing strip to reduce their cleaning and finishing costs through the use of cold-rolled material.

Another possible field for the use of controlled-atmosphere furnaces lies in the production of enameling stock. At the present time, material of this character is supplied in either a box annealed or normalized condition with a pickled finish. After forming into the desired shape, the general practice is to pickle the material prior to enameling. The pickling operation on material of this nature is rather expensive, costs running all the way from $1.50 per ton to as high as $5 per ton. On material which is welded prior to enameling it is usually necessary to sand blast instead of pickle, in order properly to prepare the welds to hold the enamel. This operation is of course quite expensive, exceeding, in general, the cost of pickling, which is used on the simpler parts. Some interesting experiments in a controlled-atmosphere electric furnace indicate the possibility of taking the material as it comes from the presses or the welders and passing it through the furnace, enameling afterward without pickling, sand blasting or other cleaning operation. The use of such a normalizing operation after forming is, in general, cheaper than pickling, the experiments carried on to date indicate the producing of a surface which holds the enamel coats very satisfactorily.

Fig. 5 shows a stove part which was enameled following such a normalizing operation without any cleaning or pickling. Use of such method of preparing a material for enameling not only saves the cost of final cleaning but also, in many cases, permits the use of a cheaper material. For material where the drawing operation is not too severe, it may be possible to make use of hot-rolled unannealed and unpickled material on which the oxide coating will be reduced in the final clean-up operation. Where it is possible to make use of such materials, the cost saving is very marked, since not only are the pickling charges reduced, but the steel mill extras for annealing and pickling are eliminated.

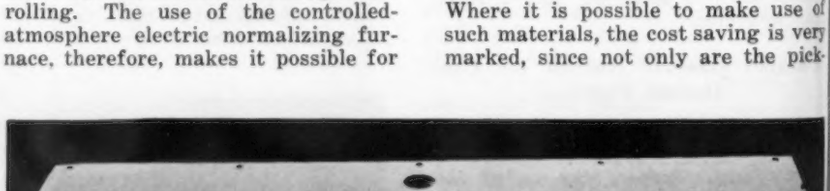


FIG. 5—This stove part was enameled without cleaning or pickling after the normalizing operation in a controlled-atmosphere electric furnace.

Eliminates "White Pickling" of Tin Plate

In the tin plate industry, more and more attention is being devoted to securing tin plate which will have the deep drawing properties associated with normalized sheet. The conventional method of obtaining this desirable grain structure lies in normalizing, following the first anneal and the first cold passes. After normalizing, the material must be pickled, given

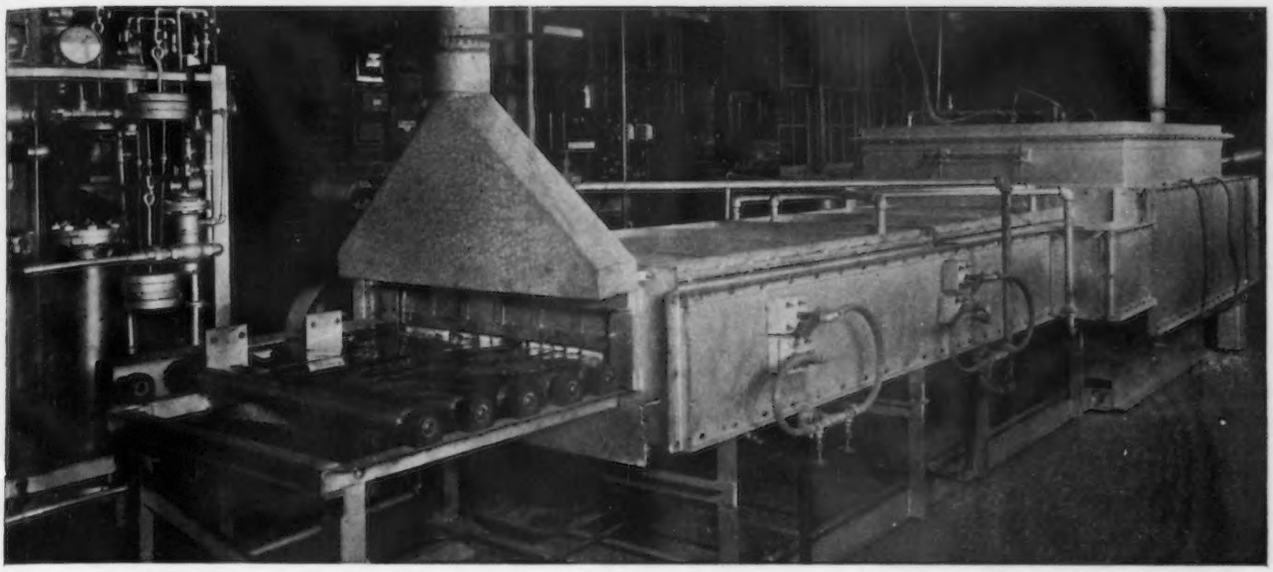


FIG. 4—Discharge end of the furnace in Fig. 3, showing the cooling chamber and run-out table. The speed of the rolls may be varied. The gaseous medium is introduced at a number of points throughout the heating and cooling chambers.

two or three additional cold passes and a wash pickle and then thinned. Through the use of controlled-atmosphere electric furnaces in place of the conventional normalizing equipment it is possible to produce the desired grain structure and still eliminate the so-called "white pickling" operation following normalizing. The light wash pickle will, of course, be required prior to tinning in order to remove the oil and dirt deposited during the final cold roll passes. The white pickling operation on material of this character represents a cost of about $2.50 per ton. The use of electric heat in place of the usual gas-fired normalizing furnace results in an additional cost of approximately $1 per ton for power. The gaseous atmosphere adds an extra 30c. per ton to this cost, leaving a net saving of approximately $1.20 per ton of material.

The controlled-atmosphere electric furnace offers to producers of steel wire the same advantages mentioned above in the case of cold-rolled sheet and strip and tin plate. As in these preceding instances, the saving lies in the elimination of the usual pickling charges and in the production of a high-quality, clean and bright product.

Steel Sheet Annealing Applications

Another application of the controlled-atmosphere electric furnace lies in the final annealing of electrical sheets after they have been punched or sheared to the desired dimensions. This anneal, which is for the purpose of removing the strains introduced by the punching or shearing operations and thus improving the electrical characteristics of the assembly, may be carried out in continuous furnaces. The material is passed through the furnace loaded upon carriers, and protected from oxidation by a suitable gaseous atmosphere. This type of annealing finds its largest application in the small motor field, where the assembled stators and rotors are annealed prior to their final assembly into the completed motor.

Another interesting application of controlled-atmosphere electric furnaces lies in the normalizing of welded steel tubing. With the development of welded tubing, it has become necessary to provide some continuous and inexpensive type of normalizing furnace which will remove the grain structure introduced by the welding operation. This operation can now be accomplished continuously and economically in an electric furnace which will turn out the tube, not only free of scale but bright and clean. The cost of pickling tubes averages around $2 per ton, against an atmosphere cost of $0.30 to $0.40 per ton, which represents a substantial saving.

Brazing in Controlled-Atmosphere

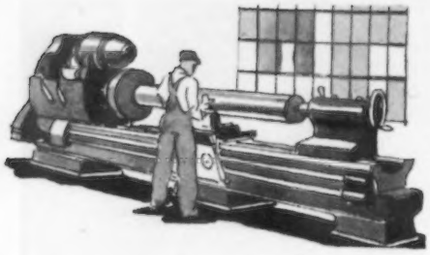
One of the most interesting fields of application of the controlled-atmosphere electric furnace lies in the brazing of steel parts. The so-called "copper brazing" of two or more steel parts in an atmosphere of hyrogen is not a new development. This process consists of assembling the parts to be joined with a fairly snug mechanical fit and placing in, or adjacent to the joints, a supply of copper in the form of wire, ribbon, or powder carried by a suitable vehicle. The assembly is then heated to approximately 2040 deg. F. in a reducing atmosphere. Under these conditions the atmosphere first thoroughly cleans the surfaces, and then, as the copper melts, it flows into the joints by capillary attraction, joining the adjacent parts with a bond that is actually stronger than the parts themselves.

Such a process has, in the past, found its limitation in the high cost of the operation. This high cost was due to two factors: first, the use of batch-type furnaces which were inherently expensive to operate; and second, the use of hydrogen gas or dissociated ammonia as a brazing medium. Since hydrogen gas purchased in cylinders costs approximately $10 per 1000 cu. ft., the reasons for the high cost are quickly apparent. With the development of a very cheap gaseous medium made from natural gas or butane, both of which are relatively cheap, it now becomes possible to produce a gaseous atmosphere at a cost of from 20c. to 30c. per 1000 cu. ft. Such a cheap atmospheric medium makes possible, in this case, as in the cases described above, the use of a continuous furnace, which is very economical in power consumption, to produce the results hitherto only obtainable in batch-type equipment.

A still more recent development along this line lies in the use of various brasses as mediums for joining the parts in place of the copper. The use of brass produces a joint substantially as strong as that produced by copper, and for most mechanical joining problems, is entirely as satisfactory. It is only limited by the fact that the joint made by using brass is somewhat porous to the action of gases, and therefore should not be used for parts which must hold gas under pressure. For uses where only a mechanical joint is required, however, brass is entirely satisfactory, and since the brazing operation may be carried on at approximately 1750 deg. F., instead of 2040 deg. F., the operation becomes much more economical.

In the non-ferrous field, the use of the cheap annealing gas described

(*Concluded on Page 78*)



Life of Turning Tools a

THE relation between the cutting speed and tool life for a given tool when cutting a given steel under constant conditions has long been known to follow the equation $VT^n = C$. This relation has been shown at different times to hold for tools of different compositions when cutting a steel, and tools of a constant type when cutting various steels. There is a wide range in value of exponent and constant, however, as factors such as tool material and shape, material being cut, and size and shape of the cut are varied. The relative importance of these factors has never been clearly defined.

The results which follow came from an investigation to determine the value of the exponents and constants of the tool-life cutting-speed equation, $VT^n = C$, for a given tool of high-speed-steel when cutting an S.A.E. 2345 steel forging. All the tests were run dry, and the data given is for cuts 0.100 in. in depth and 0.0125 in. feed per revolution. The variables studied included the tool-nose radius, side-cutting angle, side-rake angle and the back-rake angle. The experimental results show that there is a definite relation between each of these variables and the constant of the equation. The value of n and the tool-life cutting-speed equation were determined for a given tool of high-speed steel when cutting a given steel forging with a constant depth of cut and feed. The equation was then redetermined for the tool ground to a number of other shapes while keeping the tool material, the material cut, the feed and the depth of cut constant. In this way, the influence of the change in tool shape could be determined on the cutting-speed tool-life equation $VT^n = C$, as shown by the corresponding values of n and C. The effect of tool angles on the tool life is also shown.

The Material Cut

The material on which the various shaped tools were tested was a steel forging corresponding to the analysis of S.A.E. 2345. The exact chemical analysis was, 0.36 per cent carbon, 0.50 per cent manganese, 0.32 per cent phosphorus, 0.36 per cent sulphur, 0.10 per cent silicon and 3.29 per cent nickel. After forging, the material was air cooled from 1460 deg. F., and furnace cooled from 1240 deg. F. The yield point was 65,600 lb. per sq. in., and the tensile strength was 101,250 lb. per sq. in. The elongation was 25.5 per cent in 2 in., and it had an area reduction of 53 per cent. The forging had a Brinell hardness of 207, and a Scleroscope hardness of 28 to 30, as tested on various points on its periphery.

The Cutting Tools

For the tests over 100 tool bits were obtained of the regular 18-4-1 type of high-speed steel. The bits were carefully selected from the same heat, and heat treated under special conditions, so they could be duplicated as desired. The analysis of the tool steel was, 0.76 per cent carbon, 0.34 per cent manganese, 0.26 per cent silicon, 4.08 per cent chromium, 0.018 per cent phosphorus and sulphur, 1.08 per cent vanadium and 18.22 per cent tungsten. The bits were preheated to 1600 deg. F. and then raised to a high heat of 2400 deg. F. until sweat appeared. They were drawn two hours at 1100 deg. F. in lead, and when tested for uniformity and hardness they were found to average from 64 to 67 Rockwell "C." The special tool holder and tool bit are illustrated in Fig. 1, and the various angles are indicated. The particular tool shown is No. 7 in Table 1, and is referred to as 8-14-6-30-3/64-R. Table 1 lists the various angles and nose radii used on the fifteen different tool shapes tested.

One of the original investigations on this subject was made by F. W. Taylor,

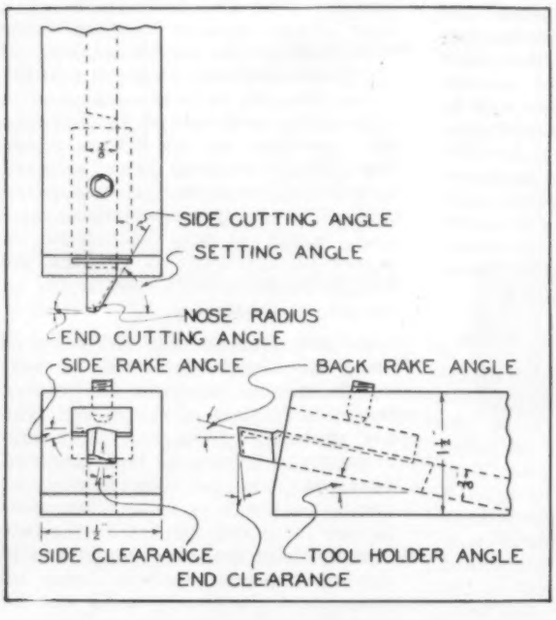
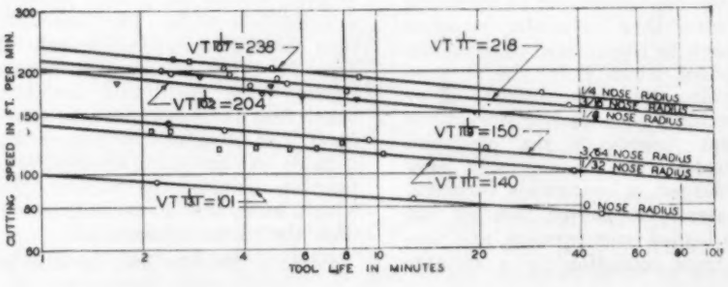


FIG. 1 (left)—Nomenclature of tool bit and holder.

FIG. 2 (below)—The effect of nose radius on the performance of high-speed steel lathe tools, 8-14-6-0-variable R.



s influenced by Shape ▲▲▲

O. W. BOSTON
Director of the Department of Engineering Shops
University of Michigan
and
W. W. GILBERT
Research Fellow
University of Michigan

and he concluded that cutting speed x tool life = a constant, or $VT^{1/8} = C$. Working for the Bureau of Standards, two other men, H. J. French and T. G. Digges concluded that the exponent should be 1/7. The two investigations were made with different types of high-speed tool steels, and various grades of material were cut during the testing. The shapes of the tools, depth of cuts and speed of cutting were also different. M. F. Judkins and W. C. Uecher conducted an investigation in 1930 in which they used a Firthite type T64 tool of cemented carbide containing tantalum carbide. When cutting various grades of steel they found that n varied from 1/6 to 1/6.4. All of the work previous to the following investigation shows that the value of the exponent of tool life in the equation giving a relation between cutting speed and tool life differs from 1/7 to 1/8.

The Tool-Life Tests

In the following work the values of the tool life T in minutes were obtained experimentally for corresponding cutting speeds V in ft. per min., when cutting the S.A.E. 2345 steel forging with the regular 18-4-1 high-speed-steel bit, 3/8-in. square, as ground to shapes shown in Table 1. In all the tests, the depth of cut was 0.100 in., and the feed per revolution of the work was 0.0125 in. For each tool shape, the values of V and T for various cutting speeds were plotted on log-log paper. It was found that for each case a straight line resulted, showing that the logarithm of V varies inversely as n times the logarithm of T. This gives rise to the equation $VT^n = C$, in which V is the peripheral cutting speed of the work in ft. per min. on the surface of the work, T is the tool life in minutes from the start of the cut up to the time of complete failure of the tool, and n is the slope of the curve or line as plotted on log-log paper. It represents the exponent of the tool life T. C is a constant which varies with the cutting conditions other than cutting speed and tool life. The length of tests was from 2 to 60 min., and it was found that all points within this range satisfied a linear relationship when plotted on log-log paper.

A heavy-duty lathe was used and by means of change gears in the head and the variable-speed transmission, the surface speed of the test log could be adjusted to any desired value. This speed was checked at all times with the surface speed indicator. The recorded cutting speed was measured while the tool was cutting, and the depth of cut in all cases was checked with micrometers or calipers.

The tool bits were clamped into the tool holder by set screws as illustrated in Fig. 1. The tool holder and bit were set at right angles to the axis of the work, so that the side-cutting edge of the tool shown in Fig. 1 of 0-deg. makes a setting angle of 90 deg. with the work. Similarly, a 30-deg. side angle tool had a setting angle of 60 deg., etc. In other words, the setting angle was, in all cases, the complement of the side-cutting angle. In this way the end-cutting angle of 6 deg. remained constant in all cases.

The tool life in minutes was measured by means of a stop watch, and was from the time the cut was started until the tool failed. Failure was indicated by the sudden breaking down of the cutting edge, and it was found to be of two types, end and side failure.

The color of the chips at different times indicates that the temperature is highest at the start of the cut with a newly ground tool, and that it decreases gradually to a minimum just before the irregular cutting edge is formed by the worn flank and cupped surfaces. The temperature again rises after this point, as the chip being removed is more irregular. The above conditions were confirmed by the use of the tool-work thermocouple in which the temperature of the tool and the work could be measured every ¼ minute throughout the tool life.

Whenever a tool failed, the shoulder at the end of the cut was burnished, and this burnished and work-hardened metal was always removed by a separate tool before starting another tool-life test. All the cuts were made dry.

Experimental Results

The tool bits were ground in accordance with the variables listed in Table 1. The experimental data covered the relations between cutting speed and tool life for each set of variables, such as different nose radii, different side-cutting angles, different side-rake angles and different back-rake angles.

To find the influence of varying the nose radius, a group of bits were ground in which the tool angles were held constant as follows: back-rake 8 deg., side-rake angle 14 deg., end-cutting angle 6 deg., side and end clearance angle 6 deg., side cutting 6 deg., and the setting angle with the tool at right angles to the work 90 deg. The tools were ground to various radii and individually tested, after which they were reground and again tested. With these tools, the life at various speeds was obtained as indicated by the lowest curve in Fig. 2.

The bits were subsequently reground with different radii as follows: 1/32, 3/64, 1/8, 3/16, and 1/4 in. Tool-life curves for each set of constant radii

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FOR many years Mr. Boston has conducted investigations relative to the most efficient cutting and milling technique. In this work he and Mr. Gilbert present data which simplifies the selecting of optimum nose radius, side-cutting angle, side-rake angle and back-rake angle in order that the tool life may be prolonged and the finish of the work improved. In addition, there is considerable evidence advanced to determine the true values of the exponents and constants of the tool-life cutting-speed equation, $VT^n = C$. The original paper will be presented by the authors at the A.S.S.T. meeting at Detroit on Oct. 2. The concluding portion of this work will be in THE IRON AGE of Oct. 5.

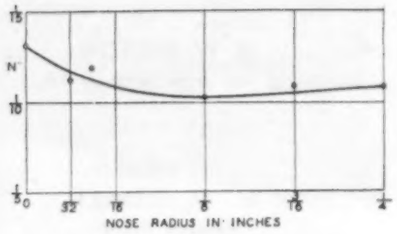
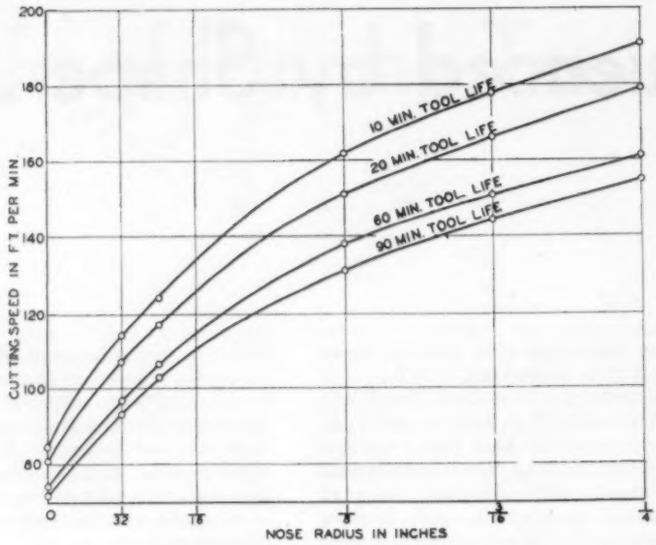


FIG. 3 (above)—Variation of n in the equation $VT^n = C$, when changing the nose radius of 8-14-6-0-variable R tool.

FIG. 4 (right)—The effect of nose radius on tool life with an 8-14-6-0-variable R tool.



were obtained as shown plotted on log-log paper in Fig. 2. The lines as drawn appear to be practically parallel. A close examination, however, shows that the slope, which corresponds to n, the exponent of T, actually changes from 1/13.1 for the 0-deg. radius tool to 1/10.2 for the 1/8-in. radius tool. The 1/4-in. radius tool shows a value of n equal to 1/10.7, slightly larger than that for 1/8-in. radius. These values are shown plotted in Fig. 3 over the nose radius. The variation, except for the 0-deg. tool, is apparently well within normal experimental error and seems to average about 1/11.

The influence of the nose radius on the permissible cutting speed for a definite tool life is illustrated in Fig. 4. The cutting speeds, as taken from Fig. 2, for a definite tool life of 10, 20, 60, and 90 minutes each for each nose radius tool are shown graphically. It is seen that the radius of the nose has a very decided influence on the allowable cutting speed for a given tool life. From the 60-min. tool-life curve of Fig. 4 it is seen that a cutting speed for the 0-in. nose radius tool is 74 ft. per min. This increases to 97 for the 1/32-in. radius tool, 106 for the 3/64-in. tool, 138 for the 1/8-in. tool, 151 for the 3/16-in. tool and 161 for the 1/4-in. tool, showing a total overall increase from 74 to 161 ft. per min. Similarly, these curves show, for tools with any given nose radius, the cutting speeds for 10, 20, 60 and 90 min., respectively.

A mathematical relation between the nose radius in inches R, the cutting speed in ft. per min. V, and the tool life in minutes T for the depth of cut of 0.100 in. and the feed 0.0125 in., is obtained by first plotting the nose radius against the cutting speed in ft. per min. on log-log paper. This gives four parallel lines as shown in Fig 5, which results in the equation $V = CR^{1/4.1}$. The value of C was found to be a direct function of the tool life by the equation $CT^{1/10.8} = K = 331$, as shown in Fig. 5. Combining these two equations a final form involving V, T, and R is obtained. This is $VT^{1/10.8} = 331 R^{1/4.1}$. The graphical method for determining the cutting speed for a given life of a tool of the 8-14-6-0 form is described in Fig. 5.

The finish left on the work by the tools of different radii varied considerably. The 0-in. radius tool, as would be expected, left a very rough surface which could not be tolerated in most production work. When the tool had worn slightly, small chips or flakes of the test log were left on the surface and could not be removed, except with a file. As the nose radius increased, the finish was improved until, with the 3/16-in. radius tool, there was a slight tendency to chatter. With the 1/4-in. radius tool, the chatter was so heavy as to be objectionable.

In summarizing the influence of various radii of the tool on its performance, it is seen that the cutting speed for a given tool life may be increased by increasing the radius. For a 20-min. tool life, the increase of speed, as the nose radius is changed from 0 to 1/4-in., is 122 per cent. For a 60-min. tool life, the increase is about 118 per cent. The most desirable cutting condition would be obtained with a radius of approximately 1/8 in. This tool gave a good finish, high cutting speed, and showed no tendency to chatter.

The increase in the radius allows a longer cutting edge of the tool to do the

Table 1. A List of Tools Used in the Test

The values of n and C as determined from the cutting-speed tool-life equation $VT^n = C$ is also given. A key developed to indicate briefly a given tool is indicated. For example, tool Number 2 is designated as 8-14-6-0-1/32-R.

Tool Number	Back-Rake Angle	Side-Rake Angle	Side & End Clearances	Side-Cutting Angle	Nose Radius in in.	n	C
1	8	14	6	0	0	1/13.1	101
2	8	14	6	0	1/32	1/11.1	140
3	8	14	6	0	3/64	1/11.9	150
4	8	14	6	0	1/8	1/10.2	204
5	8	14	6	0	3/16	1/11.0	218
6	8	14	6	0	1/4	1/10.7	238
7	8	14	6	30	3/64	1/9.1	216
8	8	14	6	45	3/64	1/9.1	237
9	8	14	6	60	3/64	1/9.0	246
10	8	0	6	0	3/64	1/10.0	136
11	8	6	6	0	3/64	1/12.5	141
12	8	22	6	0	3/64	1/13.1	155
13	8	30	6	0	3/64	1/15.3	133
14	0	14	6	0	3/64	1/15.8	144
15	16	14	6	0	3/64	1/17.8	145

work, thus distributing the pressure over a greater portion of the tool and providing a greater amount of tool material to conduct away the heat generated. This results in higher cutting speeds for a given tool life. The increase in cutting speed, however, is not proportional to the increase in length of cutting edge. This is borne out in Fig. 4.

When the nose radius increases, the average thickness of chip decreases. Thin chips have a tendency to cause chatter. A wide curved chip, as formed by a radius tool, has a thickness that varies at different points along the cutting edge, and therefore, tends to cause numerous periods of vibration, any one of which would tend to neutralize another. Undoubtedly, this influence is a function of the ratio of the nose radius to the depth of the cut. In this work, the depth of cut was 0.100 in., and the 1/8-in. nose radius tool was found to cut smoothly with no tendency to chatter. When the radius was increased so as to become much larger than the depth of cut, as in the case of the 3/16 and 1/4-in. radius tools, the variation in thickness of chip was not sufficient to dampen the vibration.

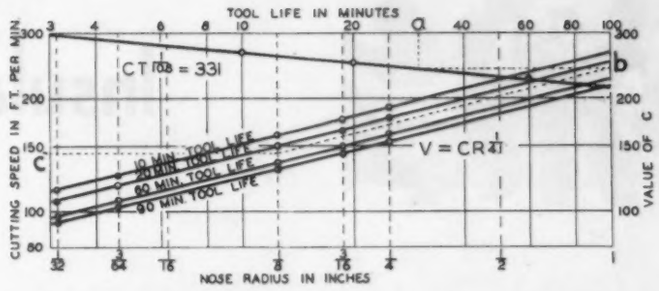


FIG. 5—Method of obtaining formulas, showing relation between nose radius, tool life, and cutting speed. The cutting speed for a tool bit 3/8-in. square of high-speed steel of the 8-14-6-0 form having any value of nose radius, is obtained for a 30-min. tool life from the chart above as follows: The point *a* representing a 30-min. tool life on the tool-life scale is selected. The dashed line is projected vertically until it intersects the curve for tool life independent of nose radius, thence projected horizontally to *b*, thence parallel to the four parallel lines until it meets the vertical line passing through the desired value of nose radius, such as 1/8 in., thence horizontally to *c* on the speed scale.

The remainder of this investigation will follow in the succeeding issue of THE IRON AGE.

Cause and Prevention of Hot Tears in Steel Castings

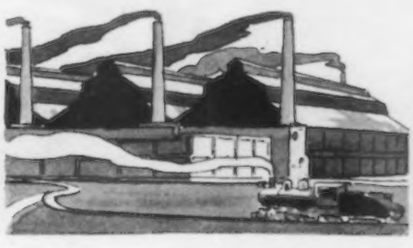
METAL contraction and hindered contraction resulting from mold resistance are responsible in large part for the existence of hot-tear cracks in steel castings. This statement is from a paper, "Studies on Solidification and Contraction and Their Relation to the Formation of Hot Tears in Steel Castings," delivered at the annual convention in Chicago, June 20 to 23, of the American Foundrymen's Association. The authors are Charles W. Briggs and Roy A. Gezelius, of the division of physical metallurgy of the U. S. Naval Research Laboratory, Bellevue, Anacostia, D. C. The discussion takes some 40 printed pages.

Other important factors tending to form tears, besides those mentioned in the first sentence quoted above, are cavities and the physical properties of the steel, say the authors. It is surprising, they add, how little experimental data are available on the actual physical processes which occur during the solidification and contraction of steel castings.

Hot tears, or contraction cracks, are defined as cracks in the metal formed at elevated temperatures by contraction stresses. The steel is subjected to stress in excess of the tensile strength corresponding to the prevailing temperature and accordingly cracks. The formation of these cracks may be aided by contraction cavities (pipes) which cause a concentration of stress. Cold cracks are the result of large inherent contraction stresses produced during cooling from the solidification temperature. These cracks appear at comparatively low temperatures.

There are two types of hot tear cracks: The internal hot tear that develops during the solidification of the casting, and the external hot tear that develops after solidification is complete but while the temperature is about 1300 deg. C. Internal hot tears are of a decidedly rugged nature with numerous branches having no definite line of continuity and usually existing in groups. They seldom terminate at the surface; most of them do not. Where they do, they are usually very small and difficult to locate. If they are explored downward, they will be found to branch out and become more pronounced. Radiographs serve to reveal them.

The external hot tear develops after solidification is complete but while the casting is at a temperature slightly below the solidification temperature, and it is caused by stresses due to mold resistance. It is called an external hot tear because the crack first opens on the surface of the casting and proceeds inward. It has the appearance of a tear—the face of it is rugged; and it is wider at the surface and is uninterrupted in depth.



Intelligent application of certain principles in casting design is one of the most important of seven methods that may be adopted to obviate the danger of hot tears, and at least to limit tear formation. These methods are listed as:

1. Flexible molds and cores.
2. Use of chills at proper places.
3. Application of ribs and wedges at certain changes of cross-section.
4. Use of a thermal non-conductive molding material.
5. Casting in pre-heated molds.
6. Pouring from elevated temperatures.
7. Casting design.

In general, casting solidification involving the principle of equal cooling throughout is held to be undesirable. Instead the more natural method of directional solidification, so-called, should be accommodated. Controlled directional solidification is successful, say the authors, only when certain principles of casting design are adopted. These principles stress the importance of feeding smaller sections through heavier ones and "studying mass effect by the use of inscribed circles."

Insulating the Open-H

NO series of articles on the natural gas-fired open-hearth furnace would be complete without some mention of the subject of insulation. The complete insulation of open-hearth furnaces has made rapid strides within recent months. This subject has been very widely discussed by open-hearth men and they all agree that insulation will save fuel. However, there is considerable variance of opinion on the effect of insulation on the life of refractories, principally the furnace roof. Some open-hearth men are of the opinion that insulation on the open-hearth roof will shorten the life of the roof, while others believe that it will actually increase the life of the brickwork. Both of these groups have data on different furnaces that support their opinions.

The fact that the life of refractories is longer on natural gas-fired furnaces than it is on furnaces fired by other fuels was mentioned previously in this series, and is one of the advantages of natural gas firing. Consequently, since natural gas is easier on brickwork than any other fuel, it is logical to assume that natural gas-fired open-hearths can be completely insulated with the assurance that the possibility of failure of the refractories is minimized.

There are many completely insulated natural gas-fired open-hearth furnaces in operation in the Pittsburgh district at the present time. The furnace roofs are usually insulated with slag wool or mineral wool while the exposed brickwork on the front and back walls and port ends is covered with insulating cement. The slag pockets and regenerators are, of course, also completely insulated. The brickwork and particularly the furnace roofs on these furnaces have stood up as well as or better than they did before the furnaces were completely insulated.

The savings in fuel that result from insulation are certainly gratifying. The roof of a 75-ton natural gas-fired basic furnace, Fig. 1, was insulated with 2 in. of rock wool cement. The furnace then went through a campaign of 347 heats, and at the end of the campaign the roof seemed to be in better shape than the roofs of uninsulated furnaces after similar campaigns. The fuel consumption was reduced 5 per cent, effecting a saving of $1,500 by an investment of $75, which was the total cost of labor and material for insulating the furnace roof. This does not leave much room for argument; natural gas-fired open-hearths should certainly be completely insulated.

Insulating the Roof

Many open-hearth plants are now insulating their furnace roofs with mineral wool or slag wool. This material seems to be entirely satisfactory and the cost is actually trifling. The usual practice is to cover the roof with 6 in. of mineral wool tamped down to a thickness of 4 in. The insulation covers the entire roof, including the ribs. Instead of this thick covering of insulation shortening the life of the brickwork as might be expected, it has actually increased the life of roofs by 10 per cent.

Why insulation should actually increase the life of the brickwork can be readily understood when one considers the effect of insulation on silica brick. When quartz, or silica, is heated to 392 deg. F., it turns into alpha

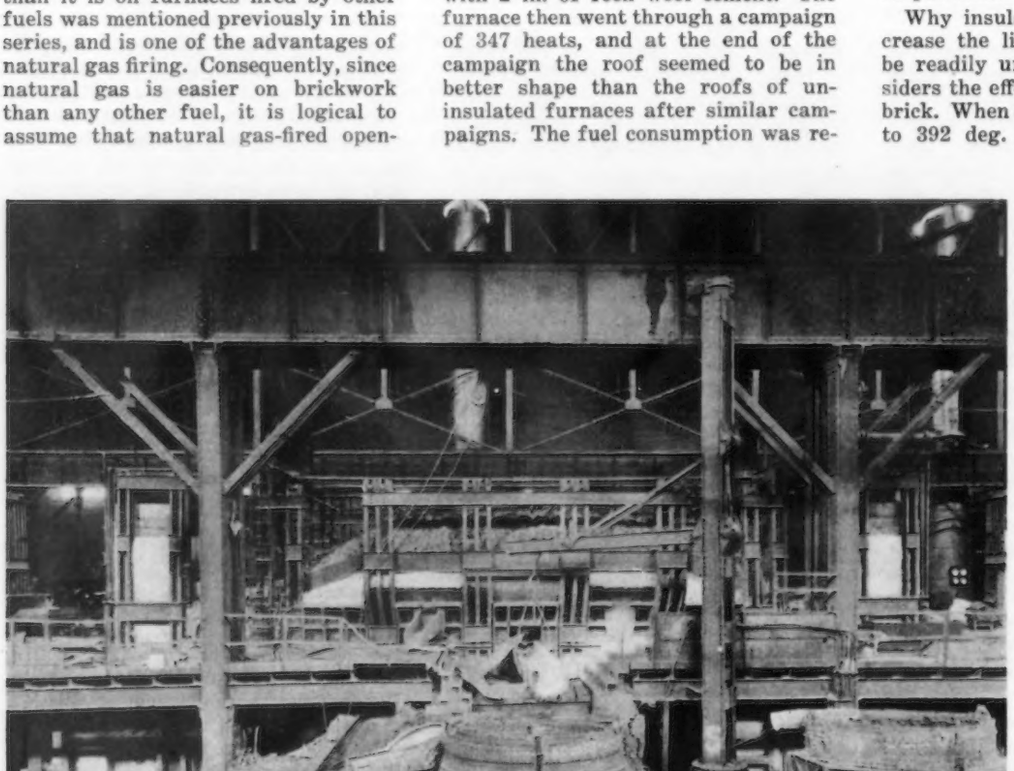


FIG. 1—A completely insulated 75-ton basic natural gas-fired open-hearth furnace.

n-Hearth Furnace

By H. J. WILLIAMS
Industrial Gas Engineer, Equitable Gas Co., Pittsburgh

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FOR insulation, to save on heat losses and prevent infiltration of air, the author recommends 4 in. of mineral wool for the roofs and 1½ to 2 in. of a cement comprising slag wool mixed with water glass for all other exposed brickwork, including the regenerating chambers. The accompanying article completes a series on the design and construction of the open-hearth furnace equipped for using natural gas as a fuel; these previous installments appeared in the issues of Aug. 31, Sept. 7, Sept. 14, and Sept. 21.

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quartz; further heating to 1067 deg. F. changes it into beta quartz; continued heating to 1598 deg. F. changes it into tridymite; then by running the temperature up to 2678 deg. F. the state of the material changes to cristobalite. In cooling this material the same allotropic varieties of silica are formed in the reverse order.

The volume changes that accompany these changes in the allotropic form of silica are as follows:

Quartz to cristobalite	Plus 14.0 per cent
Cristobalite to quartz	Minus 12.0 per cent
Quartz to tridymite	Plus 16.0 per cent
Tridymite to quartz	Minus 14.0 per cent
Tridymite to cristobalite	Minus 2.2 per cent
Cristobalite to tridymite	Plus 2.2 per cent

Besides the above changes due to the formation of different allotropic varieties of silica, there is also a large change in volume due to heating or cooling through the range of 500 to 1200 deg. F.

An un-insulated brick in an open-hearth roof is about 2940 deg. on the inside surface and 500 deg. on the outside. All the different allotropic forms of silica with their varying volumes, exist in this range and will produce varying degrees of expansion throughout the length of the brick. On the other hand, a brick in an insulated open-hearth furnace roof will be 3000 deg. on the inside and 2200 deg. on the outside. This brick will be a tridymite product throughout, except for the inner surface which will be cristobalite, and there will be practically no change in volume between the inner and outer sides of the brick. Consequently, one can readily see why an un-insulated brick should spall and go to pieces when an insulated brick will not.

In addition to increasing the life of the roof, insulation greatly reduces the heat loss through the roof, resulting in a reduction in fuel consumption. The heat loss through an un-insulated open-hearth roof and the heat loss and temperature gradients through an insulated open-hearth roof are shown on the temperature gradient chart, Fig. 2. Based on a coefficient of heat transfer between the outside of the furnace roof and the air, of 1½ times the coefficient for still air, the heat losses are 2350 B.t.u. per sq. ft. per hour for an un-insulated roof and 955 B.t.u. per sq. ft. per hour for an insulated roof. The saving of 1395 B.t.u. per sq. ft. per hour is equivalent to a 4 per cent reduction in fuel consumption.

The expected savings in fuel consumption easily justify the expense involved in insulating the roof. When 6 in. of mineral wool are placed on an open-hearth roof and tamped down to 4 in. thickness, it requires 5 lb. of mineral wool per sq. ft. of roof area. The total installed cost of this material will be about 10c. per sq. ft., or $75 to $100 for the furnace.

Another advantage of insulating the open-hearth roof is that it will increase the radiation from the roof to the metal, producing a faster working furnace, or it will maintain the same radiation on a lower flame temperature. Referring to Fig. 2, the temperature of the inside surface of the brickwork is increased from 2940 deg. F. to 3035 deg. F. by insulating the roof. However, the radiation from the roof is increased by the fourth power of these figures. The temperature differential between the furnace gases and the inner surface of the brickwork is reduced from 160 deg. for the bare roof to 65 deg. with the insulated roof; thus the same radiation and same rate of heating can be maintained with a lower flame temperature. Even a slight reduction in flame temperature will effect a noticeable reduction in rate of fuel consumption and a worthwhile increase in the life of the roof.

However, insulation on the open-hearth roof must be used with care and understanding if satisfactory results are to be secured. One must guard against over-insulation, for too thick a layer of insulating material will raise the average temperature of the brickwork. The crushing strength of silica brick in this range is a very indefinite figure. Various authorities give figures for the crushing strength at 2600 deg. F. ranging from 800 lb. per sq. in. to 200 lb. per sq. in. The temperature of 2200 deg. for the cold surface of the brick is considered to be just about the upper limit by open-hearth men.

(Concluded on Page 80)

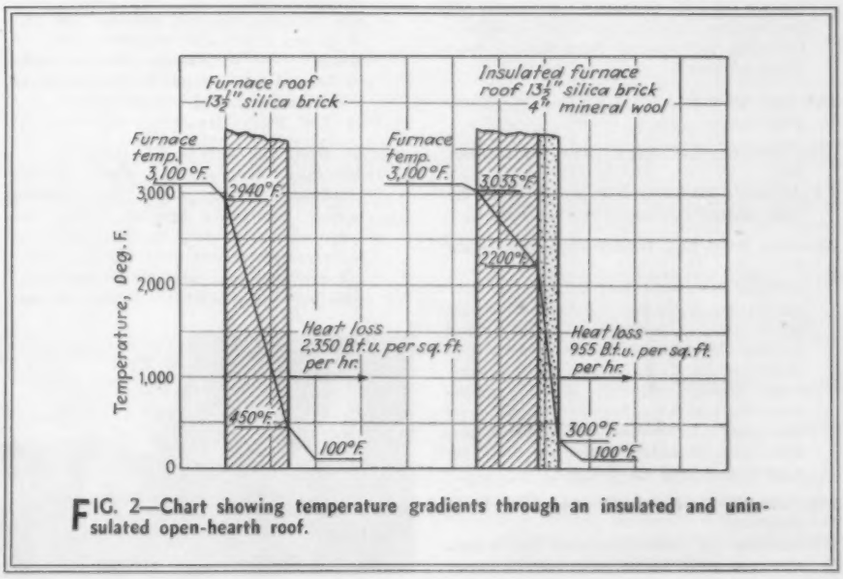


FIG. 2—Chart showing temperature gradients through an insulated and uninsulated open-hearth roof.

List of Exhibitors at the National Metal Congress, Convention Hall, Detroit, Oct. 2 to 6

Air Reduction Sales Co., New York. Booth 101.
Exhibiting (in operation): a style No. 6 Oxygraph suitable in fabricating machine parts, bases, etc.; a style No. 7 Oxygraph designed for shape cutting to precise forms and dimensions; a new Camograph, a semi-automatic machine in which the torch is driven by a magnetic roller contacting with the periphery of a cam or templet of the form required to produce the desired shape. The addition of one attachment converts it into a shape cutting machine that may be operated without the use of the magnetic tracing device.
The No. 4 Radiograph with new attachments will be demonstrated. The pipe cutting and beveling machine for cutting off and beveling pipe ranging from 4 in. to 36 in. in diameter in one operation will be demonstrated. Also on demonstration will be the Airco-Davis-Bournonville hand welding and cutting apparatus including multistage regulators. National Carbide lights and lanterns will be demonstrated. Airco oxygen and acetylene cylinders as well as the complete line of Airco welding and cutting supplies will be on display.
A Model S-A Arc Welder manufactured by the Wilson Welder and Metals Co. will be demonstrated. This demonstration will feature particularly Airco B and O shielded arc electrodes.

Ajax Electric Co., Inc., Philadelphia. Booth 150.
Exhibiting (in operation): An electric furnace for bright annealing and brazing ferrous and non-ferrous parts. The special hydrogen atmosphere for this furnace will be supplied by an Ajax electric ammonia dissociator. The newly patented Ajax helical heating element, suitable for operating temperatures up to 2000 deg. F. in an oxidizing atmosphere, will be shown installed in a typical heat treating furnace. The suspended flat roof construction carrying the heating elements is a special feature of this furnace. A display of photographs illustrates the construction and operating principle of Ajax electric heat treating furnaces.

Allegheny Steel Co., Brackenridge, Pa. Booth 171.

Allen Steel Co., Inc., Edgar, New York. Booth 104.
Exhibiting: High speed steel, hot work die steel, special tool steels and alloy steels.

American Brass Co., Waterbury, Conn. Booth 38.
Exhibiting (in operation): Demonstration of carbon and metal arc welding of Everdur metal and oxy-acetylene welding using genuine Tobin bronze welding rods will be conducted by C. E. Swift, welding engineer. Display will also include various parts and samples of beryllium copper, cast iron parts repair-welded with Tobin bronze filler rod, Everdur tanks automatically welded, and tests on Everdur.

American Car and Foundry Co., New York. Booth 52.
Exhibiting (in operation): One No. 2 two-electrode rivet heater, for heating rivets from ⅜ in. to ¾ in. diam. from 1 in. under the head to 6 in. in length. One No. 3 two electrode full automatic forging heater, equipped with electric eyes to prevent over or under heating, temperature held within 10 deg. plus or minus. For heating stock from ¼ in. to ¾ in. diameter, and lengths from 6 in. to 14 in. Nine sizes of heaters built to cover larger size stock or of larger hourly production. One semi-automatic horizontal end heater, for valve stems, screw driver ends, nail and number sets, etc.

American Cyanamid & Chemical Corpn., New York. Booth 65.
Exhibiting: Latest news on developments in the heat treating industry with the use of Aerocase.

American Gas Association, New York. Booth Gas Section.

American Gas Association Laboratories, Cleveland. Booth Gas Section.

American Gas Furnace Co., Elizabeth, N. J. Booth Gas Section.
Exhibiting (in operation): Bell type retort furnace for various heat treatments, including gas carburizing, nitriding, combination treatments such as Machlet Ni-Carb case treatment, also bright annealing, hardening, tempering, etc. New continuous heating machine for continuously heat treating in a gaseous atmosphere including Machlet Ni-Carb case treatment, carburizing, bright annealing, etc. Various styles of special burners. Automatic temperature control. Photographs of machines and installations.

American Sheet & Tin Plate Co. Booth 126.
See United States Steel Corpn.

American Steel & Wire Co., Chicago. Booth 128.
Exhibiting (in operation): Welding wires, manufacturing wires, cold rolled strip steel, springs and cold finished steel bars of carbon, alloy and stainless steels. A demonstration of welding will be carried on using Premier tested welding wire and USS stainless coated welding wire.
(See U. S. Steel Corpn.)

Aurora Metal Co., Aurora, Ill. Booth 10.
Exhibiting: "Stronger than Steel" die cast aluminum bronze parts for printing presses, locomotive blow-off valves, outboard motors, washing machines and ironing machines, power lawn mowers, counting machines, variable speed mechanisms, dish washing machines, electric switches, hose couplings, catenary hardware, spray guns, telephone equipment, electric hand saws and sanders, gasoline meters, milk bottle capping machines, machine guns, dump trucks, etc. Die cast aluminum bronze gear and worm blanks, die cast silicon bronze enclosed type centrifugal pump impellers.

Babcock & Wilcox Co., New York. Booth 165.
Exhibiting (in operation): A demonstration of the properties of B & W insulating firebrick. Two gas furnaces will be operating, one built of B & W insulating firebrick and the other of usual construction. Recording potentiometers and fuel meters will show the substantial savings in heating-up time and in fuel that are secured through use of B & W firebrick. Reports giving the amount of these savings in actual installations will be available. There will also be a complete display of all B & W refractories, including the new B & W junior firebrick.

Baldwin Southwark Corpn., Philadelphia. Booth 34.
Exhibiting (in operation): A 60,000 lb. universal testing machine; Baldwin Southwark stress strain recorder; Carpenter torsion impact machine.

Barnes Co., Inc., W. O., Detroit. Booth 62.
Exhibiting (in operation): A Marvel full automatic high speed hack saw machine with 4-speed transmission, cutting bar steel continuously. This machine is fully automatic and releases the bar, sets it forward, and starts the new cut without the aid of any human agency. Will also operate a small high speed band saw machine, cutting both sheet metal and wood.

Barnes-Gibson-Raymond, Inc., Detroit. Booth 129.

Bastian-Blessing Co., Chicago. Booth 160.

Bausch & Lomb Optical Co., Rochester. Booth 58.
Exhibiting (in operation): Metallurgical microscopes, principally such equipment as the GBILSAA, routine metallographic equipment, FSM and DHM; spectrographic equipment such as the Littrow spectrograph, measuring microscope, density comparator. Industrial microscopes such as AKW wide field microscopes, Brinell microscope, wide field tubes and the shop microscope.

Bethlehem Steel Co., Bethlehem, Pa. Booths 46 and 97.
Exhibiting: Several new shapes of Bethlehem wide-flange structural shapes, several new light joists and stanchions, a display of Bethlehem (Lackawanna) steel sheet piling sections. The bolt and nut display consists of Toughtemp steel, Mayari A steel, Supertemp steel, heat treated bolts, hot forged nuts and set screws. Kalman Steel Corpn. will show a section of a door frame, Kalmantruss and Mac-Mar truss joists. Exhibit also includes parts illustrating the various grades of Bethadur, and parts made of Bethalon free machining corrosion resisting steel. Fourteen kinds of Bethle-

hem sheets will be shown, and various kinds of wire, particularly the new zinc coated Bethanized wire. Several specimens of Mayari high-test iron will be on exhibit. A display of alloy steel will include round bars showing hot rolled finish, square billets, centerless ground bar, cold drawn bar, rough turned bar, rough turned and polished bar.

Blakeslee & Co., G. S., Cicero, Ill. Booth 82.
Exhibiting (in operation): The Blakeslee degreasing machine used to take off grease, dirt, oil, chips, etc., from stamped and machined parts, prior to plating, enameling, galvanizing, etc.

Brown Instrument Co., Philadelphia. Booth 56.
Exhibiting (in operation): Automatic control of hardening, tempering, annealing and drawing temperatures. Both potentiometer and millivoltmeter types of Brown pyrometer controllers will be shown. An interesting demonstration of the Trendalizer control system will show how the free, flexible control of a skilled human operator can be duplicated in accordance with both temperature trend and extent of deviation. In addition the new Brown mercury-switch thermometer controller and the new Brown recording thermometer and pressure gage will be shown, together with electric CO_2 meters and indicating and recording flow meters.

Bundy Tubing Co., Detroit. Booth 78.
Exhibiting: Various sizes and kinds of sweated and electric hydrogen welded steel tubing, and samples to illustrate copper electric hydrogen welding such as receiver tanks, floats, spring shackles, etc.

Campbell, Andrew C., Division of American Chain Co., Inc., Bridgeport, Conn. Booth 110.
Exhibiting (in operation): Nibbling machine for cutting metals; Hudorkut submerged cutting machine which cuts at very high speed any metal, porcelain, glass or compositions.

Carboloy Co., Inc., Detroit. Booth 3.

Carborundum Co., Niagara Falls, N. Y. Booths 152 and 154.

Carnegie Steel Co., Pittsburgh. Booth 151.
Exhibiting: Samples of various grades of carbon steels illustrating the effect of inherent grain size on hardenability and other physical properties; also the influence of grain size on forging and heat treating characteristics. Exhibit will include a number of test specimens as well as fabricated parts, such as automobile forgings, tools, etc.
Also see United States Steel Corpn.

Climax Molybdenum Co., New York. Booth 49.
Exhibiting: Exhibit will include a piece of ore of approximately 100 lb. from which any one of the following molybdenum products can be obtained: 0.67 lb. of ferro molybdenum; 0.95 lb. of calcium molybdate; 0.75 lb. of molybdenum sulphide concentrates; 0.4 lb. of molybdenum metal; 0.6 lb. of molybdenum oxide. Brief moving pictures of the mine in Climax, Colo., and the experimental laboratory in Detroit, Mich.

Cling-Surface Co., Buffalo, N. Y. Booth 15.
Exhibiting (in operation): A display showing the effect of Cling-Surface belt preservative applied to belting, and also its new product—Permac, the gasket in powder form. The Cling-Surface exhibit will consist of motors driving various types of loaded machines by means of belts, part of which has been treated with Cling-Surface belt preservative. The portion devoted to Permac will feature the use and application of Permac to flange union joints.

Cooley Electric Furnace Co., Long Island City, N. Y. Booth 20.
Exhibiting (in operation): Complete line of laboratory furnaces representing a new development, characterized particularly by the use of Doreco heating elements developed by Doherty Research Co. The Doreco element is impervious to the action of chemical fumes and vapors. The line of furnaces shown includes muffle, combustion tube, crucible furnaces and hot plates, the Doreco elements being adapted to all types. Also shown will be Semhet, a new refractory having high thermal conductivity, in several forms. A new type of industrial rheostat will also be shown.

Darwin & Milner, Inc., Cleveland. Booth 20-A.

Dearborn Chemical Co., Chicago. Booth 170.
Exhibiting: Water treatment; No-Ox-Id rust preventive; Cleaners for industrial use.

de Forest Associates, A. V., New York and Pittsburgh. Booth 29-A.
Exhibiting: A non-destructive test and inspection method for determining cracks and other defects in steel and steel parts such as related to aircraft, bus parts, street railway and steam railroad equipment.

Detroit Alloy Steel Co., Detroit. Booth 14.
Exhibiting: Alloy tool steel castings and patterns.

Detroit Edison Co., Detroit. Booths 132 and 155.
Exhibiting: Products treated in electric furnaces.

Dow Chemical Co., Midland, Mich. Booth 68.
Exhibiting: Ultra-light Dowmetal articles, including sand and die castings, extruded sections, forgings, plate and sheet, as well as specimens of riveted and acetylene and electric spot and seam welded parts. Also a separate exhibit showing the effectiveness of Dow organic solvents as metal degreasing agents. Various metal parts will be cleaned in a standard metal degreasing machine as though in preparation for plating, lacquering, or enameling operations.

Driver-Harris Co., Harrison, N. J. Booth 59.
Exhibiting: Nichrome, Chromax and other heat-resisting alloys in the form of carburizing boxes, cyaniding and pickling containers, nitriding containers, lead hardening pots, retorts, furnace parts, etc. Also electric furnace strip made of Nichrome for heating elements of electric furnaces, and many other interesting products.

du Pont de Nemours & Co., Inc., R. & H. Chemicals Department, Wilmington, Del. Booth 7.

Eberbach & Son Co., Ann Arbor, Mich. Booth 17.
Exhibiting (in operation): Metallographic polishing machines.

Eisler Electric Corpn., Newark, N. J. Booth 79.
Exhibiting (in operation): Speed spot welders. A demonstration will be given of the method of joining two metals with the use of a new timing device. A complete line of gas and air burners and torches will also be on display.

Electric Furnace Co., Salem, O. Booth 72.
Exhibiting: Photographs and enlargements of various types of electric and fuel fired furnaces and material handling equipment for various processes and applications. Also photographs of new developments and recent installations of furnaces for continuous bright annealing, brazing, nitriding etc., and samples of products processed in this equipment.

Electro-Alloys Co., Elyria, O. Booths 42 and 63.
Exhibiting: Thermalloy furnace castings and retorts.

Electro Metallurgical Co., New York. Booth 120.
Exhibiting: Numerous samples of Electromet ferro-alloys and metals.

Ensign-Reynolds, Inc., New York. Booth Gas Section.
Exhibiting (in operation): Dual heated immersion type soft metal furnace; rotary type air cooled gas compressor; ribbon burners; screen burners; flame distributing burners; air cleaning inspirators; high pressure gas inspirators; soldering furnace; staylite burners; centrifugal air blowers, centrifugal gas boosters; atmospheric burners; atmospheric inspirators.

Ford Sales Co., J. B. Wyandotte, Mich. Booth 12.
Exhibiting: Specialized cleaners and alkalies including latest developments in metal cleaners for cleaning before all electro depositions; cleaning before bonderizing and all finishing operations such as lacquering, japanning, vitreous enameling, assembling, etc. Cleaning aluminum and aluminum alloys prior to anodic treatment. Paint, Japan and enamel strippers. Miniature cleaning tanks made of glass containing air agitated cleaning solutions. These tanks are illuminated. Large picture of plant and display of various metal products treated with Wyandotte specialized cleaners prior to the many finishing operations.

Foxboro Co., Foxboro, Mass. Booth 35.
Exhibiting (in operation): A complete line of measurement and control instruments for steel treating. The new recording potentiometer—both single and multiple record—will be shown in operation. The latest design in potentiometer controllers, meters, air and electrically operated controllers, gages, and thermometers will be found in the booth.

Gas Machinery Co., Cleveland, Ohio. Booth Gas Section.

General Alloys Co., Boston. Booth 32.
Exhibiting: Nickel-chromium alloy, Q-Alloys; carburizing and annealing containers; cyanide and lead pots; furnace hearths, roller rails, heat and acid resisting chain, cyanide dipping baskets, recuperators, miscellaneous furnace parts, parts for every type heat treating furnace—carburizing, annealing, normalizing, hardening, tempering, forging, spheroidizing, tubes and retorts; corrosion and abrasion resisting castings.

General Electric X-Ray Corporation, Chicago. Booth 71.
Exhibiting: Selected radiographs, diffraction patterns and studies of heavier industrial pieces.

Globar Corpn., Niagara Falls, N. Y. Booths 152 and 154.
Exhibiting (in operation): High temperature Globar electric heating elements.

Gogan Machine Corpn., Cleveland. Booth 51.
Exhibiting (in operation): Direct depth reading Brinell hardness testing machines. Diamond electrically controlled hardness testers for hard material.

Grasselli Chemical Co., Cleveland. Booths 130 and 153.

Exhibiting (in operation): Many iron and steel and other metal products, all of which were processed by one or more of the many Grasselli products. A portion of the exhibit will show the application and value of zinc and cadmium as protective coatings. Grasselli fluxes, crystal and liquid, for the tinning, galvanizing and soldering industries, will be exhibited in the many types of fluxes required by modern industry, a great many of which were pioneered and developed by Grasselli. Grasselli Inhibitors three and eight will be displayed with a practical small-scale demonstration of pickling various types of iron and steel, with and without inhibition.

Harnischfeger Corpn., Milwaukee. Booth 27.

Exhibiting (in operation): Electric arc welder; demonstration of newest developments; display of welded samples; display of electric motors.

Haynes Stellite Co., Kokomo, Ind. Booth 120.

Exhibiting (in operation): Complete line of Haynes Stellite cutting tools, and products showing the application of hard facing to automobile valves and other machine parts. Hastelloy, the corrosion resisting alloy, and Haystellite, the diamond substitute, will also be shown. A lathe will be in operation with a Haynes Stellite cutting tool operating under the intense heat of an oxyacetylene blowpipe, showing the unique "red hardness" of Haynes Stellite.

Hobart Brothers Co., Troy, Ohio. Booth 58.

Exhibiting (in operation): Hobart Simplified arc welders—both electric and gasoline engine driven. Special demonstrations of newly developed method for successfully arc welding electrolytic copper. Also demonstrations of welding other metals.

Hollup Corpn., Chicago. Booth 66.

Exhibiting (in operation): New design electric arc welder; line of electrodes for gas and electric welding.

Hones, Inc., Charles A., Baldwin, N. Y. Booth Gas Section.

Exhibiting (in operation): Gas soldering furnaces; gas melting furnaces; gas bench furnaces; gas immersion heating units; gas burners of various descriptions for industrial uses.

Hoskins Mfg. Co., Detroit. Booth 123.

Exhibiting (in operation): Electric resistor furnaces of the smaller type; pyrometers, castings and heating-element alloys.

Houghton & Co., E. F., Philadelphia. Booth 53.

Exhibiting: The latest developments of the Houghton research staff in carburizers, quenching oil, heat treating salts, cutting oils, metal cleaners, rust preventives, drawing and stamping lubricants, pickling assistants as well as many parts processed with these materials. Also an entirely new type of industrial lubricant, known as Sta-Put lubricants, which have extremely high film strength due to a special polymerization treatment. The new "non-skid" leather belting, known as Vim Tred, which "grips the pulley like a non-skid tire grips the road," will also be exhibited in operation.

Illinois Steel Co. Booth 126.

See United States Steel Corpn.

International Nickel Company, Inc., New York. Booths 2 and 31.

Exhibiting: Display is designed to illustrate in a broad way the methods and facilities used by International Nickel Co. in the solution of metallurgical problems. A 10-minute moving picture film will be shown continuously dealing with the role played by research in modern industrial processes. A few outstanding examples of important applications of nickel alloys will be shown. Part of the space will be set aside as a "conference section" for the convenience of visitors who have problems to discuss with members of our engineering staff.

Iron Age Publishing Co., New York. Booth 73.

Exhibiting: Current issues of Iron Age.

Jones & Laughlin Steel Corpn., Pittsburgh. Booth 37.

Exhibiting: The largest display of J & L steel products ever shown at the National Metal Exposition. These will be displayed against a specially built background of steel mill scenes, two of which are animated to present true pictures of operations in a J & L open-hearth department and steel plant. Recently announced products expected to attract attention are J & L improved Bessemer screw steel, J & L hot rolled seamless boiler tubes and J & L seamless mechanical tubing. The screw stock display will feature parts for which it is being used with production increases ranging from 11 per cent to 99 per cent. Other J & L products to be displayed include: Jalcase, hot rolled and cold finished; spring wire; cold heading wire; merchant wire products; turned and ground shafting; wide cold rolled flats; tin plate; steel piling; junior beams; light weight channels; bars for concrete reinforcement and a complete line of seamless and welded tubular products.

Kelley Co., J. W., Cleveland. Booth 41.

Exhibiting: Industrial oils; carburizing compounds and heat treating salts.

Kelley-Koett X-Ray Mfg. Co., Covington, Ky. Booth 64.

Exhibiting (in operation): Industrial X-ray equipment for inspection of steel up to 4½ in. thick; X-ray equipment for continuous visual examination of articles on production line; X-ray diffraction apparatus for metallurgical testing and research. A special feature of the exhibit will be a scaled model of the largest X-ray installation in the world with a capacity of better than one million volts. This model is a duplicate of apparatus now actually in operation. Another feature of this exhibit will be a selected group of films showing various applications of X-ray inspection to industrial problems of all types.

Kemp Mfg. Co., C. M., Baltimore. Booth, Gas Section.

Exhibiting (in operation): Industrial carburetor for premixing air and gas in predetermined ratio; immersion melting with gas; model automatic lead casting and charging unit; special burner equipment for industrial heating operations.

Kompak Co., New Brunswick, N. J. Booth, Gas Section.

Exhibiting (in operation); One No. 5 M Kompak large volume water heater, connected to 100 gallon copper tank. This is a new type water heater for large tanks, with motor driven circulation pump and forced draft.

Leeds & Northrup Co., Philadelphia. Booth 168.

Exhibiting (in operation): Vapocarb controlled atmosphere for Hump furnaces in which work is heated with no trace of scaling, pitting or decarburization, and without use of packing. A fast recorder —the Speedomax—will also be shown. This machine records the temperature of moving billets as they leave a heating furnace, and records temperature fluctuations along a rail passing through a rolling mill. It responds to fluctuations in the temperature of the smoke from a burning cigarette five inches away, and shows the difference between temperature of inhaled and exhaled breath when a suitable thermocouple is held near the observer's lips. The L. & N. exhibit will also feature the latest developments in Micromax recording and controlling potentiometer pyrometers, including the round chart Model R Micromax, never before shown at a National Metal Exposition.

Leitz, Inc., New York. Booth 174.

Exhibiting (in operation): The latest type of the well-known Micro-Metallograph MM. Of even greater interest is the Darkfield illumination equipment by means of which heretofore impossible determination can be made. Also showing the Leitz simplified model of this instrument. The Guthrie-Leitz automatic grinding and polishing machine, both in single and double spindle model, will be displayed with special specimen holders. Also the latest type of universal and differential dilatometer. For the first time we present in this country a universal photomicrographic apparatus with special arrangement for macrophotography. This instrument likewise serves as a profile projection and drawing apparatus with a high degree of exactness. For photomicrography in reflected light a new type of ring illuminator furnishes even illumination. An important feature is the Frey automatic measuring stage for testing the pitch of screws and measuring block gages, etc.

Lincoln Electric Co., Cleveland. Booth 102.

Exhibiting (in operation): Automatic welding, hand welding, all kinds of electrodes for steel, cast iron, stainless steel, high manganese steel, aluminum, etc. Also exhibiting open type and totally enclosed fan-cooled type motors. Also starters for motors.

Linde Air Products Co., New York. Booth 120.

Exhibiting (in operation): A full line of oxy-acetylene welding and cutting equipment, welding rod and supplies including four new Oxweld cutting machines. These are the Oxweld Secator, a small, handy portable machine; the Oxweld Pantosec, a larger machine for stationary use; the Oxweld straight-line cutting machine and the Oxweld pipe-cutting machine. The Oxweld portable weld testing machine will also be shown.

Madison-Kipp Corpn., Madison, Wis. Booth 29.

Exhibiting (in operation): Kipp-Caster No. 15 and Kipp-Caster No. 40 Semi-Automatic Die Casting Machines. Kipp-Caster No. 15 will be in operation during the entire week of the Show, actually making commercial die castings. Also complete line of Kipp air tools. Air grinders operating from 40,000 to 60,000 R.P.M. will be in operation. Madison-Kipp lubricators for application to machine tools and engines; a display of die casting dies and typical die castings.

Maehler Co., Paul, Chicago. Booth, Gas Section.

Magnetic Analysis Corpn., Long Island City, N. Y. Booth 80.

Manhattan Rubber Mfg. Division, Passaic, N. J. Booth 121.

Exhibiting (in operation): Thin wheels cutting off bar and tube stocks, hardened tool steel, such as drills and taps, and also gates from alloy castings. Also Campbell No. 20 cut-off machine and No. 40 sprue cutter, which is being introduced for the first time.

Marburg Bros., Inc., New York. Booth 88.

Metal & Thermit Corpn., New York. Booth 144.
Exhibiting (in operation): Thermit welding supplies and equipment; Murex heavy mineral coated electrodes for electric arc welding.

Metallizing Co. of America, Inc., Los Angeles, Cal. Booth 33.
Exhibiting (in operation): Metallizing unit showing the ease and simplicity of melting, atomizing, and depositing various metals. We will also have a lathe with metallizer mounted on tool post showing the building up of shafts and spindles, using stainless steel, high carbon steel, and bronze. Various other demonstrations will include the repairing of cracked valve seats, building up undersize castings, bringing automobile pistons back to original diameter, and the metal spraying of tanks, crank shafts, coils and such.

Michigan Steel Casting Co., Detroit. Booth 111.
Exhibiting: Misco Metal cast and sheet carburizing boxes; Misco Metal cyanide and lead pots; Misco Metal corrugated pusher furnace trays; Misco Metal furnace rails, furnace parts, etc.; Misco Metal sheet dipping baskets; Misco Metal furnace conveyor belt section and operating model; polished Misco "C" propeller wheels; polished Misco "C" anchors, fittings, etc.; Misco compression fittings for light wall stainless tubing; Misco "C" valve castings.

Michigan Tool Co., Detroit. Booths 48 and 69.
Exhibiting (in operation): One Michigan gear finishing machine, showing method of finishing green gears before hardening. Also a Michigan gear lapping machine. A spiral gear checking machine, an involute form checking machine and several other checking devices for determining accuracy of gears. Also cutting tool products, such as gear shaper cutters, form cutters, hobs and miscellaneous other cutting tools. Also complete exhibit of broaches from our affiliated companies. Colonial Broach Co., and taps from Detroit Tap & Tool Co.

Micro Products Co., Peoria, Ill. Booth 83.

Milne & Co., A., New York. Booth 104.
Exhibiting: Drill steel, alloy steels, high speed steel, tool steel, file steel, Swedish Lancashire Iron and Swedish all-steel anvils.

Minneapolis-Honeywell Regulator Co., Minneapolis. Booth 119.
Exhibiting (in operation): Motorized valves for industrial furnaces, ovens and other equipment operated in accordance with two-position, three-position, floating or proportioning modes of control in heat treating and steel mill processes. Proportioning and Modutrol all-electric systems of automatic and remote control which revolutionize furnace temperature and atmosphere regulation. Geared motors for vent damper and large valve applications. Final safety shutoff or stop valves. Temperature, pressure and Protectoglow combustion safety controllers. Regulators for air conditioning, unit heater, refrigeration and boiler furnace automatic combustion control services. Con-Tac-Tor mercury switches.

Molybdenum Corpn. of America, Pittsburgh. Booth 55.
Exhibiting: Samples of metallurgical and chemical products manufactured by the Molybdenum Corpn. of America.

National Carbon Co., Cleveland. Booth 120.
Exhibiting: Applications of the modern lubricant, Gredag, and a complete line of carbon products including machine brushes and electrodes.

National Tube Co. Booth 126.
See United Stated Steel Corpn.

New Jersey Zinc Co., Inc., New York. Booth 163.
Exhibiting: The newer uses of zinc die castings in the automotive field without, however, laying too much stress on this type of application; for automotive engineers are always alert to design trends in highly diversified fields. For this reason we shall show the die casting assemblies of a gasoline pump, a meat slicer, a Ditto duplicating machine, a hand saw, a lathe. Each of these contains many quite interesting applications of zinc die castings. Besides these larger exhibits there will be on display many diverse castings, showing many of the properties of the newer zinc alloys.

Norton Co., Worcester, Mass. Booths 162 and 164.
Exhibiting: Alundum and Crystolon grinding wheels; refractories.

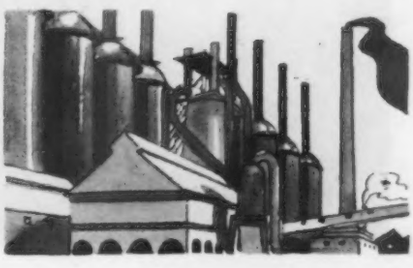
Olsen Testing Machine Co., Tinius, Philadelphia. Booth 125.
Exhibiting (in operation): A new development in universal testing machines, with all parts entirely enclosed and with weighing system entirely mechanical and independent of the loading system. This weighing system eliminates the weighing of pressure and the use of hydraulic or Bourdon gages in any form, or any type of spring balance weighing and indicating system. A combined lever and pendulum system is used and can be depended upon. The latest Olsen ductility testing machine of hydraulic loading and weighing type will also be shown, providing for variable speed and constant speed of loading. Various types of hardness testing equipment will be demonstrated and also various types of strain gages and instruments. Also the latest development in dynamic balancing machine equipment for balancing rotating parts.

Park Chemical Co., Detroit. Booth 148.
Exhibiting: Heat treating materials; polishing products; lacquer rubbing compounds; stainless steel and platers' buffing compositions.

Partlow Corpn., New Hartford, N. Y. Booth Gas Station.
Exhibiting (in operation): Temperature controls and safety gas valves.

Pels & Co., Inc., Henry, New York. Booth 25.
Exhibiting (in operation): Combination punch, plate, angle and bar shear and coper type MK 10 for punching, shearing, coping and notching plates and structural shapes without change of set-up. High speed shear and nibbling machine type AS 3 for cutting sheets to any desired shape, inside and outside.

Republic Steel Corpn., Youngstown, Ohio. Booth 50.



Exhibiting: Leading applications for Agathon alloy steels and Enduro stainless and heat-resisting steels. The display of Agathon alloy steel products will include sets of automotive transmission and differential gears, tractor drive gears, automotive forgings, such as steering arms, truck axle and steering knuckles, ball and roller bearings, aircraft engine forgings and other aircraft parts, tools, tubing and miscellaneous materials. The display of Enduro stainless and heat-resisting steels will include tubing, bolts and nuts, a miniature store front, a complete miniature model of a commercial building, beer bar, automobile wheel with stainless steel spider, ham boilers, sink, restaurant and domestic kitchen utensils, automotive trim parts, architectural sections and other miscellaneous products of popular interest. Displays of Toncan Iron pipe and Republic electric weld pipe will also be shown.

Roebling's Sons Co., John A., Trenton, N. J. Booth 1.
Exhibiting: Welding wire.

Selas Co., Philadelphia. Booth Gas Section.

Spencer Turbine Co., Hartford, Conn. Booth 117.
Exhibiting (in operation): A turbo compressor supplying air for operating gas furnaces being used by other exhibitors. Also 1 or 2 hp. size of a new single stage turbo compressor recently brought out to meet the demand for a low priced blower, similar construction to our present multistage machine but at about half the cost. Also showing a 1/3 hp. blower, the smallest turbo compressor built for individual air furnace or air service. Also a 5 hp. turbo with the casing made up of stainless steel for handling corrosive gases. Also ¾ hp. portable heavy duty vacuum cleaner.

Stuart & Co., D. A., Chicago. Booth 9.
Exhibiting (in operation): The new D. A. Stuart & Co., high load carrying capacity lubricating oils and greases for industrial and automotive requirements. The much discussed Almen (General Motor Research) extreme pressure lubricant testing machine will be in operation daily checking the lubricity of unidentified lubricants that visitors are invited to furnish. There will also be a display of parts manufactured of stainless and other alloy steels. A display of Sturaco high load carrying capacity oils and greases for severe conditions such as high loads, high temperatures and high rubbing speeds will also be featured.

Superior Steel Corpn., Pittsburgh. Booth 45.
Exhibiting articles and parts made from our rust resisting and heat resisting material such as required for modern bright parts including automobile lamps, radiator shells, tire covers, hood hinges, door handles, moldings and various other articles where a permanent bright finish is desired, including various architectural and building hardware applications. Our rust resisting material is of a chrome-iron alloy containing high percentages of chromium with or without the addition of nickel.

Surface Combustion Corpn., Toledo, Ohio. Booth Gas Section.
Exhibiting (in operation): Atmosphere furnace, air heater, continuous gas carburizing display, burner equipment, diffusion combustion forge, photographs.

Swedish Crucible Steel Co., Detroit. Booth 47.

Timken Steel & Tube Co., Canton, Ohio. Booths 131 and 133.
Exhibiting: Timken tubing and Timken alloy steels for transmission and differential

(*Concluded on Page 71*)

Massive 120-In. Planer-Type Miller with Independent Unit Heads

MASSIVENESS, accuracy, and flexibility feature the planer-type milling machine illustrated, which was built recently by William Sellers & Co., Philadelphia, for the National Transit Pump & Machine Co., Oil City, Pa. The machine is equipped with four independent unit heads and will accommodate work 120 in. by 90 in. by 29 ft.

The independent unit head design eliminates the disadvantages of long spline shafts and bevel and worm gears. Each head has its own constant-speed reversible motor which drives the spindle through chrome-nickel steel gears on short chrome-nickel steel shafts mounted on ball or roller bearings. Suitable spindle speeds are obtained conveniently by change gear levers on the head. The independent head design is empasized as resulting in flexibility, as different size cutters may be used efficiently on each head.

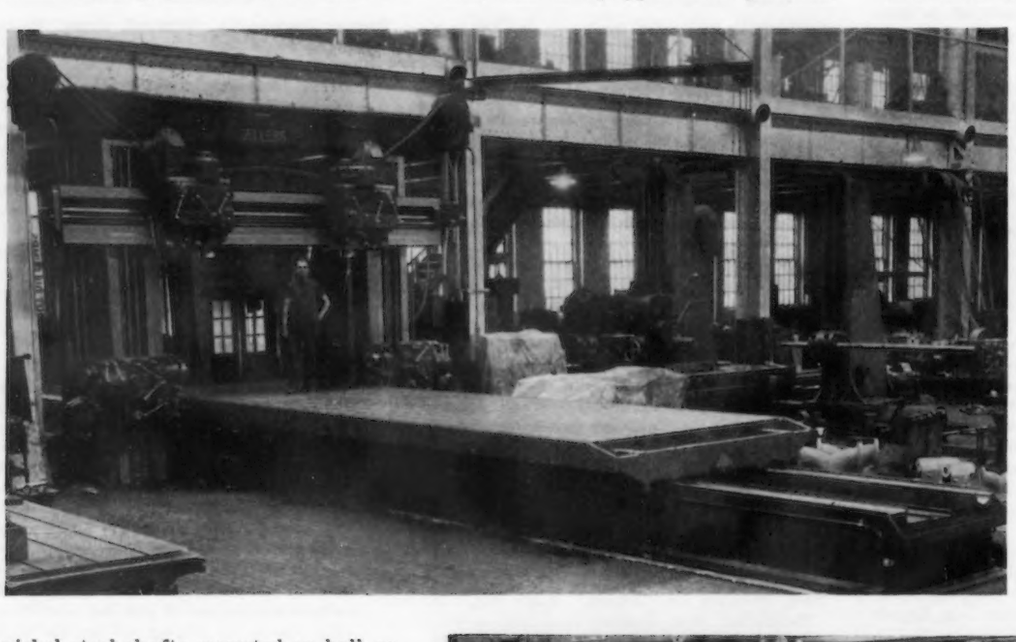
The heads are designed so that the spindle, which is a heat-treated nickel steel forging, is brought unusually close to the face of the cross-rail or housings. A built-in circular scale eliminates the large open slot for carrying the brackets for micrometer dials, and also prevents dirt from entering the spindle sleeve compartment.

Bed, table, uprights and cross-rail incorporate features intended to assure rigidity and accuracy. The bed is deep and well braced and is particularly strong at the center. Additional bracing at this point between the uprights is said to be obtained by the Sellers spiral drive. The table, of double-plate type, is thick, and is carried on a flat and combination double-V way. Holddown shoes are located at the outer edge of the ways. The table rack abuts against a fixed stop at the end of the table and is held by clamps instead of through bolts. This eliminates loosening or shearing bolts and permits the sections of rack to fit solidly against each other.

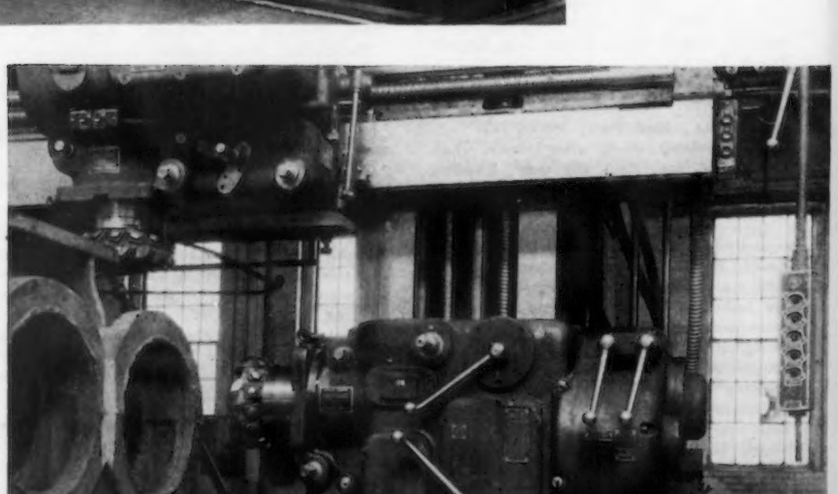
The uprights have a deep and long bearing on the bed so that severe milling strains will be distributed over a large bed area. The counterweights for the side heads are carried inside the uprights.

Of the extended back type, the cross-rail is equipped with powerful air locks. It is of uniform rectangular section for the entire distance between the uprights. The inside face of each upright has two bearing surfaces; one for the back edge of the cross-rail and the other for the cross-rail clamps. Those for the clamps are inclined at an angle so that the clamps, when locked, draw the cross-rail solidly against the front faces of the uprights and also tie the back edges of the cross-rail to the inside bearing surfaces of the uprights.

The table is driven by the Sellers spiral gear drive which in conjunction with an adjustable speed motor and a change gear box give the necessary feeds and traverse. This gear drive never has less than six teeth in contact with the rack and is so designed that no side pressure is developed. It is said to impart a smooth, even motion to the table.



THE independent unit milling head design permits efficient use of different size cutters on each head. All motors are controlled from a single panel and are operated by push buttons and pendant switches. The latter, located at each side of the machine, control the spindle as well as feed motors.



Feed and traverse for the rail heads are obtained by an adjustable speed d.c. motor and gear box at the end of the cross-rail. A similar mechanism for the side heads is mounted on the cross girt which allows the rail heads to be fed or traversed independent of the side heads and vice versa. Independent feed for the side heads and rail heads is emphasized as making contour milling practical. The spindle quills also have power feed and traverse.

All motors are controlled from one panel and are operated by convenient push buttons and pendant switches. They are fully interlocked and limit switches prevent over-travel of various parts. The spindle motors are provided with overload protection. Pistol grip handles on the spindle selector switches, at the operator's control panel, give a visible indication of the spindles and direction of rotation chosen for any particular operation.

The feed motors cannot be started until the heads selected for operation are actually rotating. Thus, it is impossible to feed the work into a cutter that is not rotating. Except for the table traverse, which is operated by convenient levers at each side of the table, the entire machine is controlled by push buttons after the desired feed and speeds have been selected. Each side of the machine is provided with a pendant push button station for controlling the spindle as well as feed motors.

To further facilitate the operation of the machine, stainless steel scales are placed on the table, cross-rail, and right-hand housing. Holders for indicators are also provided to facilitate fine adjustment. The circular scales built into each head show the amount of projection on the quill at all times. For fine adjustments, such as setting for a finish cut, dials reading to 0.001 in. are provided.

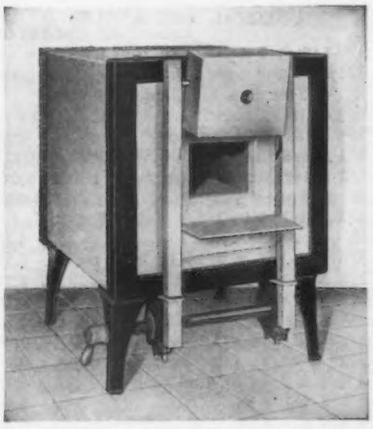
Bed and table have forced-feed lubrication provided by an independent motor-driven pump, arranged so that it must be started before the table feed motor is operated. This assures adequate supply of oil on the ways, spiral gear, etc., before any movement of the table can take place. Each head has its own independent lubricating system consisting of pressure pump and reservoir. Gear boxes are similarly equipped, whereas the bearings for the miscellaneous mechanisms are oiled by a "one shot" system.

Cutting compound is also supplied by an independent motor-driven pump and reservoir. The system is so arranged that no pipes are hung on the front of the heads; instead, the compound is brought to a stop cock projecting from the front of each head near the end of the quill. When compound is to be used, short swivel jointed pipes are connected to the stop cock.

Electric Muffle Furnace for Laboratories and Tool Rooms

FOR experimental testing, heat-treating, enameling, precipitate drying and other uses, the Cooley Electric Furnace Co., 47 Van Dam Street, Long Island City, N. Y., is offering the type MP Bluehead muffle furnace illustrated. It is stated that chemical operations that are usually damaging to nickel chromium can be done in this furnace without endangering the elements.

A Doreco heating element, developed



by the Doherty Research Co., is employed. This element consists of a material of high heat conductivity and high electrical resistivity in which is embedded a nickel chromium resistor. Formed into a dense block by hydraulic pressure and then fired at a high temperature, the element is said to withstand a compressive force of 600 lb. at 2500 deg. F. It is practically chemically inert, and is said to be so dense that fumes cannot penetrate and corrode the resistor. High dialectric strength permits close spacing of the coils without short circuiting at any working temperature.

The heat developed is said to be drawn rapidly from the wire and conducted to the surface of the unit, whence it is radiated to the furnace chamber. It is pointed out that no localized heating can occur, the heat in all portions of the coil being drawn away at nearly equal rates and diffused rapidly. The furnaces come up to 1400 deg. F. in 30 to 35 min. from cold and to 1850 deg. F. in 55 to 60 min. It is stated that measured continuously from the rear wall to the edge of the door, a maximum variation of 25 deg. has been found.

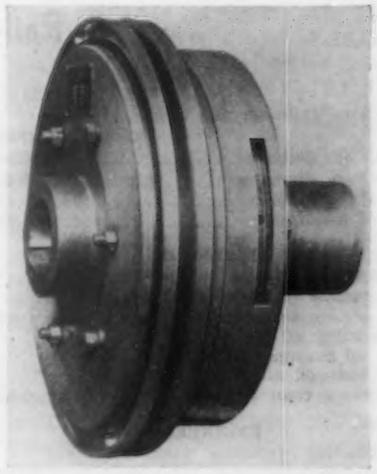
Work can be placed on the bottom element without interposing either a hearth plate or ceramic baffle. Coiled wire resistors are used, but the terminals are straight. The latter are of heavy cross-section and are connected to the coil within the block itself, an arrangement said to facilitate installation and to result in freedom from breakage and in cool connections.

Other features include use of a plug type door, vestibule, door operating mechanism of simple design and connectors that assure cool terminals. The front head is made of a material which has been fired at high temperature; it is finished in a blue glaze, from which the name of the furnace, the Bluehead, is derived. The furnaces are available in four sizes, from 1550 to 6600 watts rating. They are designed for continuous operation at 1750 deg. F. and intermittent operation at 1850 deg. F.

Safety-Type Clutch Opened Magnetically

SAFETY-TYPE magnetic clutches incorporating the principle heretofore used extensively only in magnetic brakes have been placed on the market by the Magnetic Mfg. Co., Milwaukee. Operation is opposite to that of the standard type magnetic clutch in that the clutch is closed mechanically by means of springs and opened magnetically.

This type of clutch is of particular advantage where continuous engagement is required and the clutch disengaged at infrequent intervals. A comparatively small magnet can be used with an intermittent-duty coil developing very high pressures for disengagement, while the spring or mechanical closing feature permits continuous operation without electrical connection. In addition to consider-



able saving in current consumption, positive clutching is said also to be assured, because whether electric current is available or not, the clutch will continue to be engaged. The automatic open or release feature permits push button or automatic electrical control from any convenient point.

New Extras on Rail Steel

Merchant Bars

(For intermediate sizes of all products listed the next higher extra to be charged in all cases)

ROUNDS AND SQUARES

	Per 100 lb.
3/4 to 1-1/4 in.	Base (no extra)
5/8 to 11/16 in.	$0.10
9/16 in.	0.15
1/2 in.	0.20
7/16 in.	0.30
3/8 in.	0.40
11/32 in.	0.55
5/16 in.	0.70
9/32 in.	0.85
1/4 in.	1.00

FLATS

	Per 100 lb.
1 to 6 x 3/8 to 1 in.	Base (no extra)
1 to 6 x 1-1/16 to 2 in.	$0.10
1 to 6 x 1/4 to 5/16 in.	0.15
7/8 to 15/16 x 3/8 to 3/4 in.	0.20
7/8 to 15/16 x 1/4 to 5/16 in.	0.30
3/4 to 13/16 x 3/8 to 3/4 in.	0.30
3/4 to 13/16 x 1/4 to 5/16 in.	0.40
5/8 to 11/16 x 3/8 to 5/8 in.	0.40
5/8 to 11/16 x 1/4 to 5/16 in.	0.60

TEES

	Per 100 lb.
1-1/2 x 1-1/2 and wider by 3/16 in. and larger	$0.20
1-1/2 x 1-1/2 and wider by 1/8 in.	0.40
1 x 1 x 3/16 to 1-1/4 x 1-1/4 x 3/16 in.	0.30
1 x 1 x 1/8 to 1-1/4 x 1-1/4 x 1/8 in.	0.60

Special tees: extra on application.

CHANNELS

	Per 100 lb.
1-1/2 and wider x 3/16 in. and over	$0.15
1-1/2 and wider x 1/8 in.	0.30
1 to 1-1/4 x 3/16 in. and over	0.30
1 to 1-1/4 x 1/8 in.	0.40
1 to 1-1/4 x 7/64 in.	0.60
3/4 and 7/8 x 3/16 in. and over	0.40
3/4 and 7/8 x 1/8 in.	0.50
3/4 and 7/8 x 7/64 in.	0.70

Other channel sizes subject to special prices will be furnished on application.

EQUAL LEG ANGLES

	Per 100 lb.
1-1/2 x 1-1/2 and wider by 3/16 in. and over	Base
1-1/2 x 1-1/2 and wider by 1/8 in.	0.10
1 x 1 to 1-1/4 x 1-1/4 x 3/16 in. and over	0.10
1 x 1 to 1-1/4 x 1-1/4 x 1/8 in.	0.15
7/8 x 7/8 x 1/8 in. and over	0.20
3/4 x 3/4 x 3/16 in.	0.30
3/4 x 3/4 x 1/8 in.	0.40
5/8 x 5/8 x 1/8 in.	0.75
1/2 x 1/2 x 1/8 in.	1.10

UNEQUAL LEG ANGLES

	Per 100 lb.
2 x 1-1/2 or 2 x 1-3/8 in. and wider x 3/16 in. and over	Base
2 x 1-1/2 or 2 x 1-3/8 in. and wider x 1/8 in.	$0.10
2 x 1 x 3/16 in. and over	0.10
2 x 1 x 1/8 in.	0.15
1-1/2 x 1-1/4 to 1-3/4 x 1-1/2 x 3/16 in. and over	0.10
1-1/2 x 1-1/4 to 1-3/4 x 1-1/2 x 1/8 in.	0.15
1-3/8 x 1-1/8 x 3/16 in. and over	0.10
1-3/8 x 1-1/8 x 1/8 in.	0.15
1-3/8 x 7/8 x 3/16 in. and over	0.15
1-3/8 x 7/8 x 1/8 in.	0.20
1-1/16 x 13/16 x 1/8 in.	0.40
1-1/16 x 13/16 x 3/16 in. and over	0.30
1 x 5/8 x 3/16 in. and over	0.30
1 x 5/8 x 1/8 in.	0.40
1 x 3/4 x 1/8 in.	0.40
1 x 3/4 x 3/16 in. and over	0.30
7/8 x 5/8 x 1/8 in.	0.40

Other unequal leg angles take extras of equal leg angles of the short dimensions.

Note: No. 11 gage carries same extra as 1/8 in.

Extra on angles scant of 1/8 in. to 7/64 in.	0.15
Scant of 7/64 in. to 3/32 in.	0.30

The extras for angles scant of 1/8 in. are in addition to the regular size extras.

OCTAGONS

	Per 100 lb.
5/16 in.	$0.75
3/8 in.	0.65
1/2 in.	0.35
5/8 and 11/16 in.	0.25
3/4 in. and larger	0.15

SECTIONS

	Per 100 lb.
Channel flats	Base
Cultivator beams	Base
Cultivator arch bars	Base
U bars	$0.20
"I" harrow bars	0.20
Diamonds	0.20
Triangulars	0.20
Hexagons	0.20
Oval edge "I" bars	0.20

SPECIAL SECTIONS

Extra on Application.

CUTTING TO LENGTH

	Per 100 lb.
24 in. and longer	Base
Shorter than 24 in. to 12 in.	$0.15 minimum
Shorter than 12 in.	Extra on application

Exception—Where mill is permitted at its option to ship lengths shorter than 24 in. or multiples thereof no cutting extra need be charged.

ALLOWABLE MILL VARIATION

Under 10 ft.	plus or minus 1/8 in.
10 ft. to 20 ft.	plus or minus 1/4 in.
Over 20 ft.	plus or minus 1/2 in.

SPECIAL SHEARING

	Per 100 lb.
Shearing closer than allowable mill variation	$0.10 minimum

QUANTITY EXTRA

	Per 100 lb.
Orders less than 15 tons but not under 5 tons	$0.15
Orders less than 5 tons but not under 1 ton	0.25
Orders less than 1 ton	0.50

Rail Steel Concrete Reinforcement Bars

SIZE

	Per 100 lb.
3/4 in. diameter and larger	Base (no extra)
5/8 in. diameter	$0.10
1/2 in. diameter	0.20
3/8 in. diameter	0.40
1/4 in. diameter	1.00

BENDING

Truss bars for beams and slabs, radius bending and types not otherwise described	0.30
Bending all 1/4 in. and 3/8 in. bars; all stirrups and column ties; truss bars of all sizes continuous over more than two supports	0.80

ENGINEERING

Detailing (placing plans and bar lists)	0.15
Designing (including detailing)	0.25

QUANTITY EXTRA

Orders:	Per 100 lb.
Less than 15 tons but not under 5 tons	$0.15
Less than 5 tons but not under 1 ton	0.25
Less than 1 ton	0.50

HOT-ROLLED STRIP (RAIL STEEL)

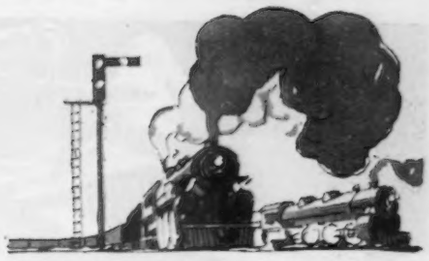
B. W. Gage No.	3/16	7	8	9	10	1/8	11	12
Gage equiv. shown in dec.	0.1875	0.190 to 0.180	0.179 to 0.162	0.161 to 0.146	0.145 to 0.132	0.125	0.131 to 0.118	0.117 to 0.105
Width (In.)								
3/8	1.45	1.45	1.45	1.50	1.60	1.60	1.60	1.70
7/16	1.25	1.25	1.25	1.25	1.35	1.40	1.40	1.50
1/2	1.05	1.05	1.05	1.05	1.10	1.10	1.10	1.20
9/16	0.85	0.85	0.85	0.85	0.90	0.90	0.90	1.00
5/8 to 11/16	0.70	0.70	0.70	0.70	0.75	0.75	0.75	0.85
3/4 to 13/16	0.55	0.55	0.55	0.55	0.60	0.60	0.60	0.70
7/8 to 15/16	0.45	0.45	0.45	0.45	0.50	0.50	0.50	0.60
1 to 1-3/8	0.35	0.35	0.35	0.35	0.40	0.40	0.40	0.50
1-7/16 to 2	0.30	0.30	0.30	0.30	0.35	0.35	0.35	0.40
2-1/16 to 2-1/2	0.25	0.25	0.25	0.25	0.30	0.30	0.30	0.35
2-9/16 to 3	0.20	0.20	0.20	0.20	0.25	0.25	0.25	0.30
3-1/16 to 3-1/2	0.15	0.15	0.15	0.15	0.20	0.20	0.20	0.25
3-9/16 to 4	0.15	0.15	0.15	0.15	0.20	0.20	0.20	0.25
4-1/16 to 5	0.10	0.10	0.10	0.10	0.15	0.15	0.15	0.20
5-1/16 to 6	0.10	0.10	0.10	0.10	0.15	0.15	0.15	0.15

Extras are given in dollars per hundred pounds.

Intermediate widths will be subject to the next higher extra.

Merchant bar (rail steel) extras for cutting to length, allowable mill variation, special shearing and quantity extras will apply to hot-rolled strip (rail steel).

Figures Show That Railroad Buying Is Overdue



By G. L. LACHER
Managing Editor, The Iron Age

IT is a tradition in the railroad equipment business that the carriers never buy in quantity except at peak prices. When prices are low they don't *need* new equipment or are unable to buy it because of financial embarrassment. When prices are high the railroads experience their heaviest traffic and show their best earnings. Consequently, at such a time, they not only need more equipment but they are able to pay for it.

Railroad Buying in Past Has Accentuated Economic Unbalance

The unfortunate effect of the concentration of railroad purchases in prosperous times is that it accentuates the forces that make our economic structure topheavy and finally cause it to crash. If some of this railroad buying could be done in dull times, the carriers would save many thousands of dollars by placing orders at lower prices and at the same time would contribute materially to the stabilization of the business cycle.

It is undoubtedly with an eye to this broader economic effect that the Government is sponsoring a plan for the financing of railroad purchases of equipment and rails. Railroad buying on a broad scale would provide a powerful stimulus to activity in the capital goods industry. Revival in producer goods would, in turn, give added impetus to demand for consumer goods. Obviously, activity in rail mills, locomotive shops and carbuilding plants would mean jobs for many thousands of idle men who would immediately translate their wages into purchases of commodities.

Is Government Aid to Carriers Uneconomic?

Everyone, especially those of us who pay taxes, is distrustful of large Government expenditures in time of widespread distress, and especially expenditures on sick industries. "Why add to railroad facilities when they are more than ample to take care of present traffic?" is a common comment. But closer examination of the subject discloses that there really is no current excess of serviceable railroad facilities. While surpluses of cars and locomotives are still reported, they are made up mainly of units that are obsolete or in such bad condition that they should be scrapped rather than repaired. The truth is that the railroads have reached a point where they actually *need* rehabilitation.

But they are reluctant to add to their already heavy debt burdens and prefer to worry along as best they can with their present facilities. That is why Government aid is now essential. Off hand, it seems uneconomic for the Government to add to its own huge indebtedness by assisting a debt-ridden industry. Yet recovery from a depression cannot come without faith in the future. In the past a revival of confidence among enterprising individuals has led to the capital expenditures that have attended economic recovery. Today, monetary uncertainty and the drastic provisions of the securities act inhibit private investment of capital. There is no capital market outside of what the Government itself is creating.

Capital Market Is Virtually Non-Existent

By showing its faith in the future of our railroad system, Washington will be performing a function ordinarily left to private initiative. If its faith is justified, its investment will pay for itself many times over. Not only will the capital goods industries be revived, but our financial system will be given new life. Securities markets will be favorably affected, Government revenues will swell, idle bank credit will be drawn into business—in short, our monetary system will be restored to normalcy.

It will be argued that all of these conclusions are based on academic reasoning, that the complexities, uncertainties and entanglements of the present economic situation do not warrant any rash departure from orthodox economic concepts. This view is epitomized by the warning of a fallen leader that "we cannot spend our way out of the depression."

No Depression Ever Shaken Off Without Spending

Yet history shows that no depression was ever shaken off without spending or without courage; and perhaps the present depression is too deep-seated and too broad in extent to be thrown off except by a *force majeure* such as only the Government can supply. We learned what audacious leadership could do in the banking crisis. And similar audacity on the part of the Administration may be necessary to pull the capital goods industry out of the rut.

How Railroad Buying Has Dried Up

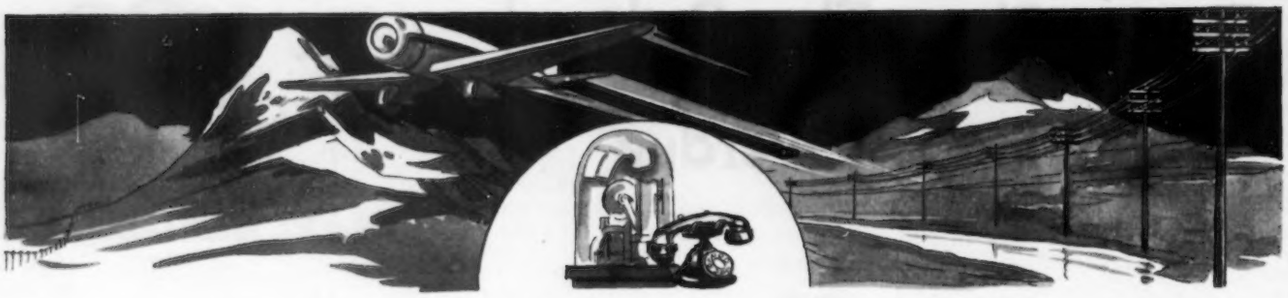
Statistically, there can be little doubt that the railroads are badly in need of rehabilitation. According to *Railway Age*, domestic purchases of railroad equipment this year, up to Sept. 19, covered only 761 freight cars, 4 passenger cars and 19 locomotives. Orders for standard-section rails placed thus far in 1933 total only 138,000 tons. These figures reflect a virtual moratorium on buying. A review of previous years of the depression adds to the dismal picture.

In 1932 only 1968 freight cars were bought and in 1931 a total of 10,880. The 1930 figure was 46,360 cars. Compare these figures with 111,218 cars—the total for 1929—or with average annual purchases of 101,578 cars during the eight years, 1922 to 1929 inclusive.

The record for passenger cars is similar. In 1932 domestic orders amounted to 39, in 1931 to only 11, and in 1930 to 667. The 1929 total was 2303 cars, while the average for the eight years, 1922 to 1929, was 2132.

Domestic orders for locomotives totaled 12 in 1932, 235 in 1931 and 440 in 1930. The 1929 total was 1212 locomotives and the average for the eight years, 1922 to 1929, was 1,352.

The accumulated shortage indicated for rolling stock is duplicated by the rail figures. Output was 402,566 tons in 1932, 1,157,751 tons in 1931, and 1,873,233 tons in 1930. The total for 1929 was 2,722,108 tons. The eight-year average, 1922 to 1929, was 2,711,081 tons.



THE NEWS OF THIS WEEK

Employee Representation Blankets Steel Industry

Plan Now Covers 85 Per Cent of Industry—Has Been in Effect 15 Years in Bethlehem Plants

MORE than 85 per cent of the steel industry is now operated under employee representation plans. At the present time 16 leading iron and steel companies are included among those which have employee representation plans. These companies are: American Rolling Mill Co., Bethlehem Steel Corpn., A. M. Byers Co., Colorado Fuel & Iron Co., Corrigan, McKinney Steel Co., Crucible Steel Co. of America, Inland Steel Co., Jones & Laughlin Steel Corpn., McKeesport Tin Plate Co., National Steel Corpn., Pittsburgh Steel Co., Republic Steel Corpn., Sharon Steel Hoop Co., United States Steel Corpn., Wheeling Steel Corpn., and Youngstown Sheet & Tube Co. Some of these plans have dated back many years.

How Bethlehem Plan Has Benefited Employees

The Bethlehem Steel Corpn.'s employee representation plan was started 15 years ago. Today the plan is in effect in the various operating units in steel manufacturing, shipbuilding, mining and in the McClintic-Marshall plants.

Under the Bethlehem plan more than 6000 cases have been reviewed and settled to the satisfaction of all. Up until June of this year, 3932 cases out of 5918 were decided in favor of the employees (more than two-thirds of the cases considered); 762 (13 per cent) were compromised; 375 (6 per cent) were withdrawn, and 849 (14 per cent) were decided in the negative.

The plan is based upon the direct election of representatives from and by the employees, with both nomination and election by secret ballot.

The general participation of the employees in the plan is indicated by the fact that in recent years more than 90 per cent of the men have voted in the election of representatives.

The representatives are formed into various committees dealing with subjects affecting employment, such as wage rates, hours, safe working conditions, etc. The plan is a strong open-shop plan and provides that no employee shall be discriminated against. Its preamble states:

> The representation of employees, as hereinafter provided, shall in no way discriminate against any employee because of race, sex or creed, or abridge or conflict with his or her right to belong or not to belong to any lawful society, fraternity, union or other organization.

President Grace Commends Plan

In commenting on the fifteenth anniversary of the plan, in the *Bethlehem Review*, Eugene G. Grace, president, Bethlehem Steel Corpn., said, in part:

"No outside agency could possibly take the place of our employees' representation plan, without destroying that all-essential direct contact and relationship so necessary to insure to employees the best possible working and living conditions, and to management the cooperation of an intelligently informed body of employees. Under the plan the employees have been kept constantly advised, through their elected representatives, of the conditions of our business; and the part they have played in counseling and originating constructive labor policies is an attainment of which every employee can well be proud."

Making it clear that the Recovery Act does not make labor union membership a prerequisite of collective bargaining, he added:

"In view of misleading statements on the much-discussed subject of the open and closed shop, of union and non-union labor, and in fairness to our employees, I feel it my duty to say plainly that no Bethlehem employee is required to belong to a labor union to get the full advantages of collective bargaining under the National Industrial Recovery Act. The act provides for collective bargaining quite independent of an employee's affiliation or non-affiliation with any organization, union or otherwise. All of these benefits of collective bargaining are afforded under our employees' representation plan without cost to the employee."

Used Machinery Dealers Organize Institute

THE National Institute of Used Machinery and Equipment Dealers has been incorporated under the New York State laws and will hold a general organization at the Hotel Statler, Cleveland, on Sept. 30. Headquarters have been established at 285 Madison Avenue, New York, and Charles A. Simmons, Simmons Machine Tool Corpn., Albany, N. Y., has been named temporary president. At the Cleveland meeting permanent officers will be elected and directors representing each of the Federal Reserve districts of the United States will be named. At the same time, it is planned to ratify by-laws, with necessary amendments. A membership campaign will be carried on and all used machinery dealers are urged to make application. As soon as organization plans are completed, a code of fair competition for the industry will be drafted.

British Steel Prices Are Stiffening As Scrap Market Advances

LONDON, ENGLAND, Sept. 26 (*By Cable*).—Pig iron business is improving, with export demand showing a notable increase. The steel market is firm, with prices stiffening as scrap advances. Steel output is at the highest rate in three years.

Tin plate is quiet, although price advances are an early possibility in view of the upward tendency of semi-finished steel and scrap. Tin plate output is now 65 per cent of capacity and is apparently headed for a decline.

No. 24 black sheets and No. 24 corrugated galvanized sheets have been advanced 5s. a gross ton.

Continental steel is dull. Despite favorable exchange United Kingdom consumers are buying little steel from Continental mills. Overseas export demand, however, is slowly improving. The European Raw Steel Cartel will fix last quarter quotas at Paris Sept. 28.

Prices for export are being maintained except for the Far East, for which delivery they have been reduced 2s. 6d. as a result of lower freight rates.

Sierra Leone is exporting foundry and basic iron ore to the United Kingdom. A trial shipment of 8000 tons has arrived for William Baird & Co., Ltd., Glasgow. Australia has removed the dumping duty on wire netting and has postponed deferred duties on tin plate until Jan. 1. The Indian Tariff Board is preparing to report on Indian steel protection acts, including the Ottawa agreement, with a view to their continuation or termination after March 31, 1934. Portugal has allowed a drawback on tin plate for re-export as oil containers.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9		
Billets, open-hrth.	£5 5s.	to	£5 12s. 6d.
Black sheets, Japanese specifications	£11		
Tin plate, per base box	16s. 6d.	to	17s.
Steel bars, open-hearth	£7 17½s.	to	£8 7½s.
Beams, open-hrth.	£7 7½s.	to	£7 17½s.
Channels, open-hearth	£7 12½s.	to	£8 2½s.
Angles, open-hearth	£7 7½s.	to	£7 17½s.
Black sheets, No. 24 gage	£9 5s.		
Galvanized sheets, No. 24 gage	£11 5s.	to	£11 15s.

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at $4.86

*Ingots	£2 5s.		
*Billets, Thomas	£2 7s.		
Wire rods, No. 5 B.W.G.	£4 10s.		
Black sheets, No. 31 gage, Japanese	£11 5s.		
*Steel bars, merchant	£3		
*Sheet bars	£2 8s.		
Plates, ¼ in. and up	£3 18s.	6d.	
*Plates, ⅜ in. and 5 mm.	£4 1s.		
*Sheets, ¼ in.	£4 6s.		
*Ship plates	£4 10s.		
*Beams, Thomas	£2 16s.	6d.	
*Angles (basis)	£3		
Hoops and strip steel over 6-in. base	£3 15s.		
Wire, plain, No. 8.	£5 7s.	6d.	
Wire nails	£5 15s.		
Wire, barbed, 4-pt. No. 10 B.W.G.	£8 15s.		

*Prices as established by European Raw Steel Cartel.

Foundrymen To Meet In Philadelphia In 1934

THE Board of Directors of the American Foundrymen's Association has voted unanimously to hold the 1934 convention and exhibition of the association in Philadelphia, and to arrange a convention without an exhibition for 1935. The international committee of foundry technical associations has awarded to the American Foundrymen's Association the honor of holding in the United States in 1934, the Fifth International Foundry Congress and Exposition. The staging of this important event in connection with the annual convention of A.F.A. which is usually held in May, has been set for the week of Oct. 22, a date following the annual conventions of the cooperating European associations. The meetings, exposition, and international congress will be held in Philadelphia's new auditorium, one of the largest and most completely equipped convention halls in the world.

Coke Output Continued To Rise During August

PRODUCTION of coke during August increased over July, continuing, to a somewhat lesser degree, the steady upward trend of daily output since the beginning of April. The daily rate of 96,919 tons for beehive and by-product coke increased 4.2 per cent over the month preceding, and was the highest since May, 1931.

Output of by-product coke amounted to 2,923,418 tons, or 94,304 tons per day, as compared with a daily rate of 90,236 tons during July, and 47,545 tons in August, 1932. The gain over July was principally at merchant plants, where the daily average of 29,168 tons increased 7.8 per cent; at furnace plants the increase amounted to 3.1 per cent. One by-product coke plant, idle since the beginning of 1933, resumed operations during August, and another active plant fired 51 new Koppers-Becker ovens built at a previous date. The comparative lull in blast furnace activities during August was reflected in the production of beehive coke, which showed a decrease of 4.4 per cent in daily output.

Cites Need for Capital Goods Purchases

MARKED revival in the purchase of capital goods is the most economically healthy substitute for monetary inflation, according to John W. O'Leary, president of the recently formed Machinery and Allied Products Institute, an association of trade organizations in the machinery field. "While controlled inflation may be of value in times like the present, it must continue to be controlled if permanent good is to come," asserted Mr. O'Leary.

Mr. O'Leary emphasized the findings of economists that the purchase of consumer goods, more especially food, clothing, household furnishings and the like, has been little curtailed during the past three years. Therefore, restoration of capital goods buying on a normal level would doubtless offer the same stimulus toward recovery that artificial inflation would.

Ohio River Shipments Of Steel Are Higher

SHIPMENTS of iron and steel products on the Ohio River in the Pittsburgh area in August totaled 69,531 net tons, as against 62,096 tons in July, 56,484 tons in June, and 43,621 tons in August, 1932, according to the current report of the United States Engineer Office, Pittsburgh. Total movement of steel products on the Monongahela River last month were 67,389 tons, compared with 68,453 tons in July, and 26,390 tons in August last year. Shipments of iron and steel on the Allegheny River in August aggregated 3234 tons.

Orders for Foundry Equipment Are Heavier

FOUNDRY equipment orders increased during August, according to the Foundry Equipment Manufacturers Association, whose index for 17 reporting companies rose to 56.28. The July index, covering 13 companies, was 48.6, as compared with 18.6 in August, 1932, with 15 companies reporting. The index for unfilled orders, as of Aug. 31, was 50.2.

Code Procedure Further Clarified by Commercial Resolutions

As the iron and steel industry approaches the end of its first month of actual operation under the code of fair competition, procedure has been further clarified by the issuance of additional commercial resolutions, which now number 24, and by the amending of Regulation No. 2, which relates to permission to sell at less than the published base price. These resolutions and amendments are effective immediately and will do much to facilitate the smooth operation of the code.

Regulation No. 1, which defined the jobber, was printed in THE IRON AGE last week. The second regulation permits selling at less than the published base price in the following cases: to mail order houses who may be accorded the same treatment as accredited jobbers; galvanized sheets when sold to manufacturers of formed roofing products shall be accorded a $2 a ton reduction from the base price; galvanized wire when sold to manufacturers of wire fencing, bale ties, wire strand or guard cable, shall be accorded a reduction of 25c. per 100 lb.; wire rods when sold to manufacturers for further processing shall be reduced $1 a ton for delivery at points in Ohio, Indiana, Illinois, Pennsylvania and Texas and $9 a ton less than the all-rail published freight charge for delivery to California. In conforming with this regulation members of the code are required to follow essentially the same procedure as with jobbers in the filing of names of customers, etc.

Commercial resolutions relating to the maximum rates of discount for early payment and the special maximum period of free credit on pipe sales to jobbers; to special terms with respect to sales of pipe to jobbers in lieu of consignments of stocks; to special terms for Pacific Coast jobbers; to special terms for woven wire fencing; to the sale of pipe to jobbers at less than published base prices; to allowances on sales of products in indirect export, and, to the establishment of average arbitrary switching charges at Gulf and Pacific Coast ports, have already been explained in THE IRON AGE. No. 6, regarding indirect export, has been further clarified by amendment, now providing for allowances on sheets for steel drums and culverts, on bars, plates and shapes for fabrication outside of the country, on rolled steel car wheels and rolled or forged axles for manufacture of cars for export trade, and on tin plate.

The additional resolutions are briefly summarized as follows:

Reductions in Delivered Prices on Other Than All-Rail Rates

RESOLVED that, until otherwise determined by the board and pending a more detailed investigation of the problems presented by deliveries of products by other than all-rail transportation, any member of the code whose plant or plants are located in the South Atlantic, Gulf Coast or Pacific Coast states may allow a reduction in the delivered price otherwise chargeable under Section 4 of Schedule E of the code for any product sold or contracted to be sold by such member for delivery at a port located in any of such states or through such port to a place of delivery in any of such states by an amount which will make the delivered price of such product at such port or place of delivery as low as that permitted by a resolution adopted by the board on Aug. 29, 1933, as amended Sept. 20, 1933, approving certain reductions in the delivered prices of products delivered at or through South Atlantic, Gulf Coast and Pacific Coast ports.

Minimum Rate of Interest

RESOLVED that the board hereby establishes, pursuant to the provisions of Section 6 of Schedule E of the code, six per cent (6%) per annum as the minimum rate of interest that each member of the code shall charge and collect on the amount of any invoice for products sold by such member after the effective date of the code remaining unpaid after the expiration of the period of free credit allowed by such member in respect of such invoice in accordance with the provisions of said Section 6; and that the Secretary be, and he hereby is, directed to mail a copy of this resolution to each member of the code.

Reductions in Price of Southern Foundry Pig Iron

RESOLVED that, until otherwise determined by the board, any member of the code which shall produce pig iron at any plant located in the Southern wage district or in the Birmingham wage district be, and it hereby is, permitted in quoting and billing for such pig iron sold by it for delivery outside of such districts, to allow a reduction in its published base price for such pig iron at the basing point on which such base price shall be based by an amount of not more than 38c. per gross ton.

Delivery of Plates, Shapes or Bars for an Identified Structure

RESOLVED that in any case in which the published freight tariffs of the railroad companies do not provide through rates with the fabrication in transit privilege on plates, shapes or bars from the plant of a member of the code to the freight station at or nearest to the place at which such products are to be used in the erection of an identified structure, then the place of delivery of such products shall be deemed to be the shop of the fabricator by whom they were purchased.

Deductions for Products Sold in Less-Than-Carload Lots

RESOLVED that if any member of the code, or any jobber or other purchaser of any product for resale who shall have signed an agreement with any member of the code in one of the forms annexed to Regulations No. 1 or Regulations No. 2 prescribed by the board on Aug. 29, 1933, shall sell or contract to sell any product to any party in a less-than-carload lot and the all-rail published tariff less-than-carload freight rate on such product from the basing point on which the base price thereof shall be based to the place of delivery of such product to such party shall be more than twenty-five cents (25c.) per hundred weight greater than the all-rail published tariff carload freight rate on such product from such basing point to such place of delivery, such member or such jobber or purchaser for resale, as the case may be, may allow to such party a deduction from the base price of such product at a rate which shall be not greater than the difference between (a) the all-rail published tariff less-than-carload freight rate on such product from such basing point to such place of delivery and (b) the all-rail published tariff carload freight rate on such product from such basing point to such place of delivery plus twenty-five cents (25c.) per hundred weight on such product.

Deductions in the Base Prices of Cold Finished Carbon and Alloy Bars

RESOLVED that any member of the code which, at the effective date of the code, had outstanding any quotation of any price for any cold finished carbon and alloy bars which by its terms was stated to be good until Oct. 1, 1933, may allow a deduction from the published base price of such member for such bars in respect of any shipment thereof to any purchaser to whom such quotation was given which shall have been made on or before Oct. 15, 1933, and which shall have been ordered by the purchaser thereof in reliance on such quotation on or before

Sept. 30, 1933, in an amount which shall not be greater than the amount by which the delivered price otherwise chargeable by such member for such bars under the code shall exceed the delivered price of such bars to such purchaser pursuant to such quotation.

Deductions in Base Prices for Slack Barrel Hoops

RESOLVED that any members of the code, which, at the effective date of the code had outstanding any quotation of any price for slack barrel hoops which by its terms was stated to be good until Jan. 1, 1934, may allow a deduction from the published base price of such member for such hoops in respect of any shipment thereof to any purchaser to whom such quotation was given which shall have been made on or before Dec. 31, 1933, and which shall have been ordered by the purchaser thereof in reliance on such quotation on or before Dec. 15, 1933, in an amount which shall not be greater than the amount by which the delivered price otherwise chargeable by such member for such hoops under the code shall exceed the delivered price of such hoops to such purchaser pursuant to such quotation.

Deliveries of Products by Truck at Places Not Reached by All-Rail Transportation

RESOLVED that in any case in which any purchaser of any product shall require delivery thereof at a place which is not located within the switching limits of any city or town and at which delivery thereof cannot be made by all-rail transportation and delivery thereof at such place shall be made by truck, the member of the code which shall sell or contract for the sale of such product to such purchaser for delivery at such place shall add to the delivered price of such product otherwise chargeable pursuant to the provisions of said Section 4 for delivery at the nearest point to such place at which such product could be delivered by all-rail transportation an amount which shall not be less than $1 per ton of such product so delivered.

Qualifications of Jobbers of Tool Steel

RESOLVED that anything in Regulations No. 1 prescribed by the board of directors Aug. 29, 1933, to the contrary notwithstanding, if any person, firm, association or corporation shall qualify as a jobber of tool steel in all respects except that it does not as a rule purchase such tool steel in carload lots, such person, firm, association or corporation shall nevertheless be deemed to be a jobber in respect of tool steel for all purposes of Section 4 of Schedule E of the code and of said Regulations No. 1.

Delivered Prices for Products Destined for Delivery in the Canal Zone or Alaska

RESOLVED that, until otherwise determined by the board,

(a) In any case in which any purchaser shall require that any product purchased by him from a member of the code be delivered at a Canal Zone port, the delivered price at such port which such member of the code shall quote and bill for such product shall be not less than the lowest delivered price which could be obtained by adding the published base price (plus any extras required to be added thereto or less any deductions permitted to be

made therefrom under Section 7 of Schedule E of the code) of such member for such product then in effect under the code at any basing point to the lowest published water or rail-and-water transportation charges, as the case may be, then in effect on such product from such basing point to such port;

(b) In any case in which any purchaser shall require that any product purchased by him from a member of the code be delivered at an Alaska port and a Pacific Coast port is not named in Schedule F of the code as a basing point for such product, the delivered price at such Alaska port which such member of the code shall quote and bill for such product shall be not less than the lowest delivered price which could be obtained by adding the published base price (plus any extras required to be added thereto or less any deductions permitted to be made therefrom under Section 7 of Schedule E of the code) of such member for such product then in effect under the code at any basing point to the lowest published water or rail-and-water transportation charges, as the case may be, then in effect on such product from such basing point to such Alaska port; *provided, however,* that, if there shall not then be a published water or rail-and-water transportation charge, as the case may be, on such product from such basing point to such port, then such member of the code may sell such product for delivery f.o.b. dock at any Pacific Coast port to which there is a published water or rail-and-water transportation charge, as the case may be, and from which such product may be reshipped to such purchaser at his risk and expense; and

(c) In any case in which any purchaser shall require that any product purchased by him from a member of the code be delivered at an Alaska port and a Pacific Coast port is named in Schedule F of the code as a basing point for such product, the delivered price at such Alaska port which such member of the code shall quote and bill for such product shall be not less than the sum of (1) the lowest published base price (plus any extras required to be added thereto or less any deductions permitted to be made therefrom under Section 7 of Schedule E of the code) of such member for such product then in effect at any Pacific Coast port which is a basing point for such product and (2) the lowest published water or rail-and-water transportation charge, as the case may be, then in effect on such product from such basing point to such Alaska port; *provided, however,* that if such transportation charge shall be unreasonably high, or if there shall not then be in effect a published water or rail-and-water transportation charge, as the case may be, on such product from such basing point to such port, then such member of the code may sell such product for delivery f.o.b. dock at such basing point from which such product may be reshipped to such purchaser at his risk and expense.

Sale of Products to United States Government

RESOLVED that the provisions of Section 6 of Schedule E and of Schedule G of the code shall not be deemed to apply to any sale or contract for the sale of any product to the Government of the United States of America or to any agency thereof in any case in which such Government or agency shall pursuant to law impose terms of payment other than those prescribed in said Section 6 or in said Schedule G; *provided, however,* that no member of the code shall allow to such Government or any agency thereof more favorable terms of payment than those which shall be prescribed by such Government or agency pursuant to law.

Switching Charges at Basing Points Other Than Gulf and Pacific Coast Ports

RESOLVED that, for the purposes of the provisions of Section 4 of Schedule E of the code, the requirement to add the appropriate switching charges to the base price of any product in making delivery thereof at any basing point other than a Gulf port or Pacific Coast port shall be deemed to have been satisfied, until the board of directors shall otherwise determine, if, in determining the delivered price of such product at such basing point, in lieu of the actual published tariff switching charges, the member of the code shipping such product for delivery at such basing point shall use the arbitrary charge hereinafter prescribed for such basing point, to wit:

(a) for deliveries in carload lots (minimum 30 tons) at Chicago and Evanston, Ill., and Gary, Ind., 60c. per ton, net or gross, as the case may be;

(b) for deliveries in carload lots (minimum 25 tons) at all other basing points listed in Schedule F of the code except Gulf ports and Pacific Coast ports, 50c. per ton, net or gross, as the case may be; and

(c) for deliveries in less-than-carload lots at all basing points listed in Schedule F of the code, except Gulf ports and Pacific Coast ports, 10c. per 100 lb., with a minimum of $2 per shipment but not in any case exceeding on any one shipment the charge per carload at the carload rate hereinabove specified for the basing point in question.

Filing of Contracts Existing Aug. 19 for All or Part of Purchaser's Requirements

RESOLVED that, if any member of the code shall be a party to a contract which existed at the effective date of the code and under which such member has contracted to sell to the other party thereto all or a substantial part of the requirements of such other party of any product to be specified on or before Sept. 30, 1933, and under such contract such other party shall have specified quantities of such products which such member will not be able to ship on or before Oct. 15, 1933, such member shall on or before Oct. 5, 1933, file with the Secretary a copy of such contract and a report showing the amount of such product specified thereunder during the month of September, 1933, and the amount thereof which such member will not be able to ship on or

before Oct. 15, 1933, and stating the reasons why such member has accepted specifications under such contract for quantities of such product which such member cannot ship on or before said date.

Deductions for an Identified Construction Project

RESOLVED that, if in any case any member of the code shall have quoted a price for any product to any prospective purchaser thereof for use in an identified construction project and such member of the code shall have agreed that the quotation of such price shall remain good for a period of 60 days after the date on which any increase in the published base price of such member for such product shall have become effective, such member may, upon any sale or contract for the sale of such product to such prospective purchaser for use in such construction project made at any time within such period of 60 days, allow to such prospective purchaser a deduction from the then published base price of such member for such product in an amount which shall not exceed the amount of any increase in such base price which became effective at the beginning of such period of 60 days.

Modification of Paragraph 5 of Jobber's Agreement

RESOLVED that, if any member of the code shall import for sale in the United States any product produced outside of the United States by an affiliated company of such member and such product is not produced in the United States by such member and a base price for such product shall be contained in the list of base prices filed by such member under the code and such member shall in all respects comply with the provisions of the code in the sale of such product, such member may, first having obtained the approval of the Committee on Commercial Matters, add to paragraph 5 of the form of agreement which such member shall be required to make with any jobber in respect of such product pursuant to Regulations No. 1 prescribed by the board on Aug. 29, 1933, a proviso to the effect that such paragraph shall not apply to any such imported product sold to the buyer under such agreement.

Allowances on Sales of Products in Intrastate Commerce in California, North Carolina and Oregon

RESOLVED that any member of the code which shall sell or contract for the sale of any product in intrastate commerce within the States of California, North Carolina or Oregon may allow to the purchaser of such product a deduction from the base price therefor otherwise chargeable pursuant to the provisions of Section 4 of Schedule E of the code in an amount which shall not exceed the amount of sales tax payable upon the sale of such product under the laws of such States, respectively.

The Black & Decker Mfg. Co., Towson, Md., manufacturer of portable electric tools, has shown a consistent monthly increase in volume and earnings since April. Employment has increased 127 per cent and all classes of employees are working shorter hours and at a higher rate of pay.

Pig Iron Production in First Half Up Sharply from Preceding Six Months

PRODUCTION of pig iron and ferroalloys in the first six months of 1933, according to the official data of the American Iron and Steel Institute, amounted to 4,488,885 gross tons, an increase of 26 per cent over the 3,551,814 gross tons produced in the last half of 1932, but a decrease of 14 per cent under the 5,229,639 tons made during the first half of last year.

Coke pig iron output in the six months ended June 30, 1933, was 4,383,664 tons, while production of ferromanganese and spiegeleisen amounted to 50,648 tons, a total of 4,434,312 tons. This compares with 4,441,002 tons as computed by THE IRON AGE in its regular monthly tabulations and published on July 6.

Of the coke pig iron production, only 529,484 tons was produced for sale, the remainder being for the consumption of producers. In the corresponding 1932 period 925,605 tons was merchant iron.

As in the two preceding half years, Ohio led all other States in production of pig iron and ferroalloys with 1,514,120 tons. Pennsylvania was second, with 1,148,125 tons, while Indiana, West Virginia and Illinois followed in the order named.

Production of pig iron and ferroalloys by grades is shown in the accompanying table.

PRODUCTION OF PIG IRON AND FERROALLOYS

(In Gross Tons)

Grade	First Half of 1933	Second Half of 1932	First Half of 1932
Pig iron:			
Basic	2,582,002	1,970,422	3,104,005
Bessemer and low-phosphorus	1,350,390	913,467	1,307.001
Foundry	254,759	334,610	476,874
Malleable	190,914	187,575	232,148
Forge or mill	887	1,022	536
Miscellaneous	11,025	7,613	14,391
Total pig iron	4,389,977	3,468,276	5,081,388
Ferroalloys:			
Ferro-manganese and spiegeleisen	50,648	38,330	55,314
Ferro-silicon	34,816	38,488	86,220
All other ferroalloys	13,444	6,720	6,717
Total ferroalloys	98,908	83,538	148,251
Total pig iron and ferroalloys	4,488,885	3,551,814	5,229,639

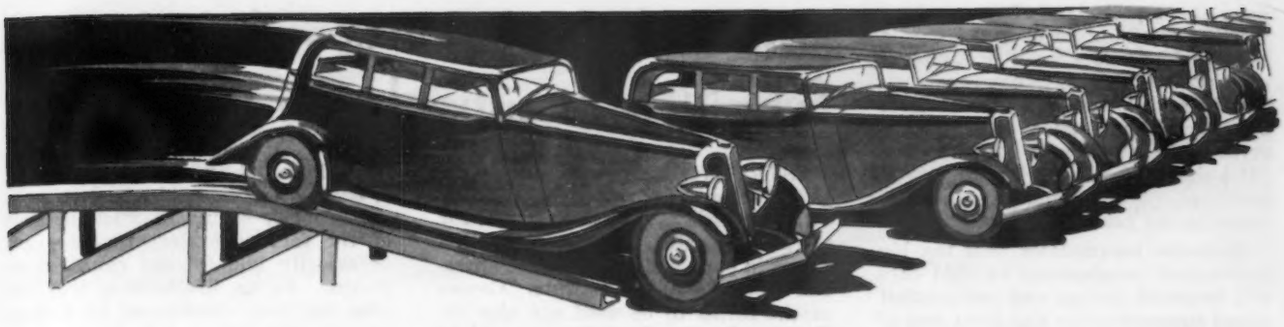
Commodity Price Index Continues to Rise

THE wholesale commodity price index continued to rise during the week of Sept. 16, according to the Bureau of Labor Statistics of the Department of Labor. The index at 70.5 reached the highest point that has been attained for the present year and shows an increase of more than 18 per cent over the low point of the year reached during the week of March 4 at 59.6. The Bureau's index number of the general level of wholesale prices for the week was 70.5 showing an increase of more than 1 per cent.

Status of Exporters Under Codes Explained

THE status of exporters under codes submitted before the National Industrial Recovery Administration, and being drawn up for such submission, is explained in a series of joint recommendations drafted by a committee representing export organizations throughout the country and being circulated to more than 4000 export firms. Vigilance is urged on exporters by this national committee to insure that codes for industries including exporters do not have the effect of applying to export trade any conditions intended only for domestic business. Conferences extending over two months have been held in Washington by representative exporters to determine the validity of these recommendations, and they are now issued, according to the National Foreign Trade Council, as being fully appropriate for the export situation.

Studebaker Corp. will introduce next Saturday its 1934 models, consisting of three lines of cars in the high, medium and low-medium price classes. Its October schedule calls for production of 7500 to 8000 units. Under its receivership Studebaker has cut its manufacturing overhead and its selling and administrative expenses 50 per cent, or $160 per car.



▲▲▲ THIS WEEK ON THE ASSEMBLY LINE ▲▲▲

Bar, Strip and Sheet Users at Detroit Granted Arbitrary Delivered Prices

DETROIT, Sept. 26.

NEVER has the automobile industry gone through a period fraught with greater difficulties than at present. Manufacturers are in the midst of the task of adjusting hours to conform to the NRA code. They likewise are trying to work out the problem of meeting increasing costs of labor and materials without adding any more than necessary to next year's retail prices. With retail demand being sustained at a remarkably good rate, they must decide what the public wants in 1934 and make change-overs in their processes with as little interruption as possible to production. In some cases companies are occupied with smoothing over labor trouble which has come up in their plants.

Then the matter of securing modifications in the steel price structure under the code is being given close attention; in this respect manufacturers already have scored a point in the decision of the steel industry to establish an arbitrary delivered price at Detroit and consuming centers nearby on merchant steel bars, hot-rolled strip and hot-rolled and cold-rolled sheets. This price represents a concession from the all-rail rate.

Arbitrary Freight Allowance of 15c. per 100 Lb.

For merchant steel bars the freight rate, effective Oct. 1, to Detroit has been arbitrarily fixed at 15c. per 100 lb., making the delivered price 1.90c. per lb. This figures back to 1.75c., Pittsburgh, the newly announced schedule. The rate on hot-rolled strip and sheets will be 20c. per 100 lb. added to the Pittsburgh base price. Southern Michigan cities outside Detroit now taking a 31c. freight rate from Pittsburgh will pay a delivered price $1 a ton above the Detroit price. This will apply to Pontiac, Flint, Port Huron, Jackson and Lansing.

While this arrangement is eliciting favorable comment on the part of steel users, the large automobile companies still are caustic in their criticism of the steel code. They contend that they are entitled to price concessions for volume and that they should not be penalized in taking delivery of steel at the mill door. Few people are aware of the large tonnages of steel which has been moved from mills to the fabricating point in trucks owned by the consumer or contracted for by him. Important consumers emphasize that the price structure under the code has generally removed the incentive to place sizable tonnages with a few selected mills and that the trend will be to spread business among a considerably greater number of companies. Moreover, there will no longer be any appreciable advantage in buying ahead instead of on a hand-to-mouth basis.

These opinions, of course, should be somewhat discounted, as they originate with users whose main object is to buy steel as low as possible. In fact, some of these users go so far as to maintain vigorously that they will not be satisfied until a Detroit base is established on all steel products made in this district and they privately admit that they are working toward that end. Nevertheless, many of the steel people acknowledge that some of the objections to the present set-up are based on solid grounds, particularly the ruling virtually barring the trucking of steel from the mills.

General Motors Near End of 1933 Run

General Motors' units are nearing the end of their 1933 production run. Buick has practically cleaned up manufacture of its current models, while Chevrolet's local gear and axle plant and its Flint plant will complete their quotas early in October. Chevrolet is said to have made 55,000 to 60,000 motors at Flint this month, with the number of assembled cars running about 55,000 units. Chevrolet has let some of its parts contracts for its next year's trucks, but has done little yet on contracts for passenger car parts. It seems likely that Chevrolet's manufacturing plants will be down only two weeks with production of parts for new models starting about Nov. 1. October probably will be a relatively lean month for Pontiac, Oldsmobile and Cadillac, although assemblies of present cars will continue throughout the month.

Chrysler does not yet show signs of slowing down from its high production rates, particularly in its Plymouth and Dodge divisions. It is said that dealers are having difficulty in getting deliveries of some models of both these lines, despite the large volume of assemblies. In addition to its purchases of well over 100,000 tons of steel, Chrysler is understood to be stocking substantial tonnages of pig iron and coal on old contracts. Plymouth has been operating close to its all-time peak level.

Ford Adopts 32-Hr. Week

Ford has not relaxed its activities and now is changing over to a 32-hr. week, running four days a week 8 hours a day. Since it recently has been on a schedule of 40 hours, it is cutting down the hours each man works so that they average not more than 35 hours a week over a six months' period. This represents voluntary compliance with the regulations specified in the automobile code, which Mr. Ford refuses to sign. The Ford com-

pany is reported to be undecided whether to maintain operations on a basis of 32 hours a week or run three days one week and five days the next. Ford's retail sales are said to have been exceptionally good, boycotting by certain States notwithstanding, and little change from the current rate of about 50,000 cars monthly is anticipated in the near future.

Evidence accumulates that the big mechanical development in 1934 cars will be coiled springs and independent wheel suspension for the front end of the car, including in some cases the elimination of the front axle. Practically every manufacturer is feverishly working in its engineering division on this problem and it appears that this improvement will not be confined to a single company, but will be adopted by several. Coiled springs result in easier riding, because jolts are not transmitted to the car itself so severely as with the present design. Coiled springs will mean the use of less steel per car, especially where the front axle is discarded. However, steel manufacturers will have to reconcile themselves to a decreasing consumption of steel per car as light alloy steels come into their own and greater emphasis is put on designing lighter cars.

Manufacturers of low-price cars are determined to advance prices next year as little as possible. It will be recalled that the automobile code does not attempt to control prices, and the fight among Chevrolet, Ford and Chrysler is becoming so intense that it is reasonable to assume that none of the three will blunder by raising prices unless compelled to. It is roughly estimated that materials, including steel, for a low-priced car have gone up $15 and the labor cost $10, or a total of $25. If production increases next year, as makers fully expect, the greater volume will cut down the manufacturing and labor costs so that the added expense of producing an automobile may not be large. Thus the retail price probably will not be boosted as much as earlier surveys indicated. It is conceded, however, that builders of medium-price cars will feel much more severely than low-priced car makers the effects of increased costs because of their limited volume of business.

Detroit Notes

Pig iron shipments this month to automotive users will be in about the same volume as in August. . . . Finishing mills of district steel companies are operating at practically 100 per cent. . . . The new open-hearth furnaces of Great Lakes Steel Corpn. will not be ready for another month. . . . Chrysler has just made the first boat shipment of finished cars from New York to the Pacific Coast. . . . Machine tool purchases by automobile companies are expected to be fairly brisk in the next few weeks. . . . Ford is understood to have placed a fair tonnage of finished steel the past week at the old prices.

Institute Issues Instructions for Submitting Statistics Under Code

INSTRUCTIONS for compiling data for reports and statistics required by the code of fair competition for the iron and steel industry have been issued in pamphlet form by the American Iron and Steel Institute. Copies of the forms to be used are also included. The institute is prepared to furnish these forms to members and requests that they be used exclusively in compiling data.

The first form, designated as AIS Form 1, calls for a report on the number of employees working, hours worked, and employees working in excess of six days in any one week. This form is to be submitted to cover periods of four weeks and five weeks up to March 3, 1934. Subsequent dates for filing the report will be established at that time. AIS Form 2 is designed for explanation of employees (other than those exempted) working over 48 hours a week or more than six days in any one week. It is to be filed simultaneously with Form 1.

The number of employees, average hours worked per week and average earnings per hour are to be reported in AIS Form 3. Average hours per week are to be calculated by dividing the total hours worked by the number of employees and the quotient then divided by monthly divisor factors which are as follows: For September, 4.29; October, 4.43; November, 4.28; December, 4.43; January, 4.43, and February, 4.00. An auxiliary report, AIS Form 4, is provided for supplying the number of employees receiving less than common labor rates as provided in the code.

Forms 5 and 6 cover the number of employees (other than those exempted) working during a six months' period, and the average hours worked per week, and an explanation of employees (other than those exempted) working an average of over 40 hours per week in any six months' period, respectively.

Capacity and Production Figures

Capacity and production figures on pig iron and steel are covered in AIS Forms 7, 8 and 9, which are to be rendered to the institute monthly commencing August, 1933. Capacity, as of Sept. 1, is required in Form 7 and columns are provided for the current month's production as well as output for the year to date. Figures are to be classified according to the districts designated in the code for the purpose of determining labor rates.

Of particular interest in Forms 8 and 9 are deductions from theoretical capacity which can be charged to operating delays. The blast furnace capacity form contains a column headed "less deduction account of relining, rebuilding and operating delays." It is pointed out that "this reduction of the capacity should be made because of the fact that blast furnaces are necessarily idle for the causes mentioned. As an illustration, this idle time has been determined by a large producer of pig iron to be approximately 10 per cent, but whatever percentage is used to justify this condition, such percentage should be shown in the space provided and in case any percentage other than 10 per cent is used, data to explain it should be furnished."

The corresponding column in Form 9, covering open-hearth, electric and crucible furnace capacity is headed "less deduction account of rebuilding and operating delays," with the following explanation: "This reduction of the capacity is made because of the fact that furnaces are necessarily idle for the causes mentioned. As an illustration, this idle time has been determined by a large producer of steel to be approximately 12½ per cent, but whatever percentage is used to justify this condition, such percentage should be shown in the space provided and in case any percentage other than 12½ per cent is used, data to explain it should be furnished."

Capacity and production for sale are covered in Form 10, which is also to be rendered monthly commencing with August, 1933. "It is realized," according to the instructions, "that many companies may not be able to determine their production for sale monthly. Such companies may currently report shipments in lieu of 'production sale,' but when reporting the data for the current month column on the December report, such monthly figures for each item should be adjusted in order that such adjusted figures for the month of December, when added to the totals for the 11 months, will represent the total production for sale for the year. This form also calls for shipments made for export and to members of the iron and steel code.

AIS Form 11 covers capacity, production, income and wages and is to be rendered to the institute quarterly, beginning with the three months ending Sept. 30, 1933. Form 12, dealing with capitalization, is to be rendered yearly, and the first report should include capitalization as of Dec. 31 in both 1933 and 1932.

Department of Commerce, Second Lighthouse District, Chelsea, Mass., is in the market for a 6-ton gasoline driven tractor crane to be installed in a new blacksmith shop. Bids close Sept. 30.

▲ ▲ ▲ THIS WEEK IN WASHINGTON ▲ ▲ ▲

National Recovery Administration Undertakes Creation of Permanent Organization

By L. W. MOFFETT
Resident Washington Editor, The Iron Age

WASHINGTON, Sept. 26.—With most of the important basic industrial codes in operation or about ready to become effective, the National Recovery Administration is moving forward with reorganization plans looking to administration of its machinery. To this end the NRA proceeded last week with plans for a permanent organization, proposing what it terms a system by which industry will regulate itself with as little governmental interference as possible. The plans take into account the shifting of personnel of the Administration, the merging of as many industries as practicable under as few basic codes as possible and the creation of regional agencies of the National Labor Board to mediate labor disputes.

By order of Gen. Hugh S. Johnson, National Recovery Administrator, Thomas S. Hammond, director of the Emergency Reemployment campaign, has begun the establishment of a permanent organization calling for the transfer of personnel and the consolidation of codes. Plans for establishing regional agencies of the National Labor Board were announced by its chairman, Senator Robert F. Wagner.

Permanent Organization Centers in Policy Board

The permanent organization will center in a new Policy Board created under the chairmanship of Mr. Hammond. It apparently is based on the belief of General Johnson that features of the National Recovery Act will be continued by Congress after the law expires on June 16, 1935.

The NRA is seeking to have all industries under codes by the end of the present year. As yet, however, approval of the permanent setup has not been forthcoming from the Cabinet Advisory Board which was established some time ago by Secretary of Commerce Daniel C. Roper. The board has nevertheless discussed the matter with General Johnson, and it is understood agreement has been reached as to the advisability of reducing the codes into as small a number as possible and making them permanent. Codes now are being examined with a view to their revision where it is deemed necessary and consolidation wherever practicable.

Appointment of Robert W. Lea, a deputy administrator, as an assistant administrator for industry, was the first move in the plans of reorganization. Mr. Lea succeeds Dudley Cates, whose differences with General Johnson over a labor policy resulted in the resignation of Mr. Cates.

An executive order pointed out that the new Policy Board was created "in anticipation of working out a change in our organization to accommodate the gradual merger of the Blue Eagle work into the work of code hearings and to free the time of the administrator by a greater delegation of responsibility and authority.

Members of the Policy Board under the chairmanship of Mr. Hammond, Mr. Lea; Alvin Brown, administrative assistant to General Johnson; Edward F. McGrady, assistant for labor; Charles Michaelson, chief of public relations; Malcolm Muir, deputy administrator; Donald R. Richberg, general counsel; Mrs. Charles C. Rumsey, chairman of the Consumers' Advisory Board; Dr. Alexander Sachs, chief economist; Kenneth M. Simpson, deputy administrator; Nelson Slater liaison officer between the NRA and the Agricultural Adjustment Administration; Walter C. Yeagle, chairman of the Industrial Advisory Board; Dr. Leo Wolman, chairman of the Labor Advisory Board; C. C. Williams, deputy administrator, and Robert K. Straus, liaison officer between the divisions of the Administration.

W. L. Allen, former steel executive, who has been a deputy administrator, was named to the board, but resigned last Wednesday to resume his work as consulting engineer in New York.

Labor Board to Have Regional Agencies

In announcing plans for the early creation of regional agencies of the National Labor Board to mediate disputes, General Johnson and Chairman Wagner said that pending their appointment the Compliance Boards now being organized in cities and towns throughout the country will report threats of strikes or lockouts or labor disputes growing out of alleged non-compliance with the President's Reemployment Agreement to the NRA in Washington. They will be referred to the Wagner Board.

The statement said that there has never been any difference of opinion or conflict of authority between the administrative side of the NRA and its National Labor Board. The NRA, it was asserted, is depending on Compliance Boards for a major contribution to the ultimate success of the recovery program. Through the nearly 5000 such boards to be created, it was stated, the Administration's rulings and policies will be available for prompt clarification of the misunderstandings, which the statement said are responsible in most cases for noncompliance with the President's agreement.

Can Makers and Farm Equipment Manufacturers Insist on Open Shop

WASHINGTON, Sept. 26. — A hearing on the code filed by the can manufacturers, held last Wednesday before Deputy Administrator H. O. King was marked by the insistence of producers upon two clauses interpreting and qualifying the collective bargaining guarantee of the act. One clause is the so-called "merit" provision such as is carried in the automobile code. The other clause interpreted collective bargaining under the NRA to mean that:

"No employee shall be required to join any organization to secure or retain employment or to secure the benefits of this code, and the right of every individual to refrain from joining any organization, and the right of employee and employer to bargain together free from interference by any third party, is hereby recognized."

Refuse to Withdraw Qualifying Clauses

R. E. Desvernine, New York, counsel for the can manufacturers, replied emphatically in the negative when he was asked by Mr. King if the industry would be willing to withdraw the two clauses and leave the interpretation of the Recovery Act to the President. Mr. Desvernine told Deputy King that "employee representation plans" are being worked out in the industry to fulfill the purpose of the collective bargaining section of the Recovery Act. Asked about these plans, involving negotiations through company unions, Mr. Desvernine said none was being followed throughout the industry but that each company was handling the matter in its own way. He promised to file copies of by-laws to show how the workers are being organized in specific instances.

Asked by Mr. King if the can manufacturers would be willing to treat with officials of existing labor organizations outside of the industry, Mr. Desvernine said he believed they would refuse. He declared that labor conditions in the industry, which is largely unorganized, were "perfectly happy" and the industry wanted them to continue so. Referring to the "individual merit" clause which Gen. Hugh S. Johnson, National Recovery Administrator, has said he permitted in "an unguarded moment" to be incorporated in the automobile code, Mr. Desvernine said: "It would be manifestly unfair to recognize a fundamental right to one industry and deny it to another."

A. F. of L. Insists on Closed Shop

A lively attack on the two labor clauses was made by the American Federation of Labor through R. S. Newham of the metal trades department. In doing so, Mr. Newham was carrying out a consistent policy of the American Federation of Labor in demanding the removal of all "open shop" and "individual merit" clauses from code. Such attacks are being made repeatedly. They were made at a number of other hearings last week. Among them were hearings on the farm equipment code and the boot and shoe code. General Johnson has said that such provisions will have to be stricken from codes. Moreover, even the interpretation of the collective bargaining clause made by General Johnson and General Counsel Donald Richberg of the NRA was eliminated from the bituminous coal code by President Roosevelt himself.

The American Federation of Labor has thus consistently gained its point and now is driving for complete domination of labor control. This has been made extremely clear by President William Green of that organization who has said there is room for only one labor organization—the one which he heads—and that this will be emphasized at the annual meeting of the American Federation of Labor here next week. Also, he has stated, organized labor will go further and renew its insistence upon the 30-hr. week, five-day week, with still higher wages.

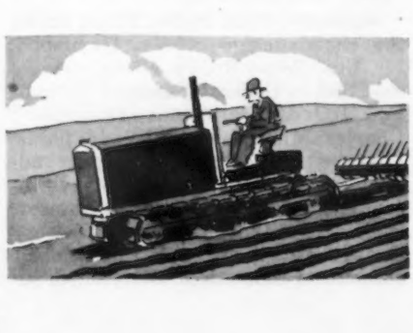
In his attack on the open shop clause in the can manufacturers' code, Mr. Newham conceded that "There is nothing in the Recovery Act which prevents an employer from selecting and advancing his employees on the basis of merit."

Proceeding further, Mr. Newham took occasion to add:

"However, it is entirely up to the President to interpret the act and entirely up to the NRA to administer it, and this attempt to nullify the purposes of the section has no place in this code."

Clash on Hours and Wages

Spokesmen for the industry also clashed with Mr. Newham and other labor representatives over the schedules for hours and wages. The code provides for a 40-hr. week in general, with 48 hr. allowed 12 weeks a year with no limit on the number of hours that may be worked at any time so long as time and one-third is paid for all over 48 hr. H. W. Phelps, New York, chairman of the Board of the American Can Co., asked special consideration for the unascertainable peaks which, he said, made it imperative that the industry be permitted to operate practically unlimited hours at various times of the year. Organized labor representatives asked a 30-hr. average week with a definite limit on overtime during the seasonal peaks. The proposed code provides that the minimum factory wage shall be 30c. an hour in the North, 27½c. in the South. Mr. Newham asked for a minimum of 40c. an hour.



Same Issue Comes Up in Farm Equipment Code

Request that the "open shop" and "merit" clauses be stricken from the farm equipment code was made by Frederick Lauterwasser of Philadelphia, representing the American Federation of Labor. He made his request in a brief and also asked for higher wages and shorter hours than those provided in the code, seeking a 35-hr. week and 60c. an hour for the least skilled worker. The code provides for a 40-hr. average week with a maximum of 48 hr. Its wage scale ranges from 30c. to 40c., based on zones, for factory workers.

Deputy Administrator George Brady, who presided at the farm equipment code hearing, was told by Charles Wiman, president of the National Association of Farm Equipment Manufacturers, sponsor of the code, that labor costs are higher in this industry than in others. He called attention to the "peculiarity" of the industry, saying it rested in the fact that the only customer of the industry is the farmer. In 1932, he said, the industry suffered a loss of $32,500,000. C. S. Messinger of the Oliver Farm Equipment Co., chairman of the code executive committee, asked that due consideration be given to the depressed condition of the American farmer "and that a balance between the benefits of this code and the burdens of this code be maintained equitably among employers, employees and the farmer."

Organized Labor Wins Victory in Coal Agreement

The vigorous efforts of the American Federation of Labor to unionize industry met with unusual success last Thursday when the Northern Coal Control Association and the Smokeless and Appalachian Coal Association, representing more than 70 per cent of the country's soft coal tonnage, signed a labor contract with the United Mine Workers of America. These coal groups heretofore have been almost entirely non-union. The contract was signed only to the extent that employees are represented by the United Mine Workers. Al-

though it is binding on the operators whose employees desire to have the United Mine Workers represent them, some of the operators themselves have expressed the view that the employees will quickly be brought under that organization. The contract is to run until March 31, 1934, and representatives of the operators and the United Mine Workers will meet Jan. 5 of next year with NRA officials to decide upon any revisions that may be agreed upon as to wages, hours, differentials, etc., as well as conditions to be included in a new argeement to become effective April 1, 1934.

The historic character of this contract between the operators and the United Mine Workers was denoted by a joint statement issued by the operators and President John L. Lewis of the United Mine Workers, hitherto hardly on personal speaking terms. The operators joining in the statement are J. D. A. Morrow, president of the Northern Coal Control Association, and E. C. Mahan, president of the Smokeless and Appalachian Coal Association.

"Unquestionably, this agreement is the greatest in magnitude and importance that has ever been negotiated in the history of collective bargaining in the United States," said the statement. "Its sponsors believe it marks the beginning of a new era in the task of stabilizing and modernizing the economic processes of this basic industry."

Authors of the agreement "commended it not only to the President but to the people of the United States." The operators, however, insisted successfully upon a clause, leaving management of the mines in their hands. The stipulation provides that "the direction of the working force and the right to hire and discharge are vested exclusively in the operator, and the United Mine Workers of America shall not abridge these rights." By many this clause was seen as the source of sharp disputes between the mine operators and the United Mine Workers.

Hearings on Aluminum Codes This Week

WASHINGTON, Sept. 26. — Joint hearings on three codes involving the aluminum industry will be conducted by Deputy Administrator Philip C. Kemp on Thursday of the present week. The codes were filed by the Association of Manufacturers in the Aluminum Industry, claiming to represent 95 per cent of that industry, by three companies engaged in fabrication of aluminum and by the Aluminum Research Institute, claiming to represent 80 per cent of those engaged in the production of secondary aluminum and its alloys.

The basic code of the aluminum industry provides for minimum wages of $15 per week in cities of more than 500,000 population, graded down to $12 per week in towns of less than 2500 population. This minimum is fixed for office employees. For other employees rates range from 25c. an hour in the Southern rural districts for mining bauxite up to 35c. in the North for males and 30c. for females, with a 5c. differential in the South below the wage paid males in the North for manufacturing processes. It is provided, however, that there shall be no discrimination between male and female when the amount of labor performed is substantially the same. The maximum week hours are 42 for continuous process operation, 40 for non-continuous process operation averaged over a period of six months; no week to be more than 48 hr.

The code for the aluminum fabricating industry fixes the minimum wage for factory workers at 50c. an hour, with a maximum work week of 35 hr.

The code filed by the Aluminum Research Institute fixes a minimum hourly wage of 35c. unless the rate was lower than that on July 15, 1929, and in no event less than 30c. an hour. The maximum work week is fixed at 40 hr. averaged over six months and not more than 48 hr. or six days in any one week.

Plate Requirements for 10 Destroyers Placed

WASHINGTON, Sept. 26. — The Carnegie Steel Co. was awarded 2400 tons, and the American Sheet & Tin Plate Co., 2000 tons of galvanized steel plates for 10 destroyers to be built at navy yards. Awards for the plain black steel plates were announced in THE IRON AGE of last week, except for 40 tons, which went to the Alan Wood Steel Co., and 150 tons which went to the American Sheet & Tin Plate Co., 2000 tons of galvanized ments for the 10 destroyers amounted to 6000 tons, awarded as follows:

	Tons
Carnegie Steel Co.	
Galvanized	2,400
Black	250
American Sheet & Tin Plate Co.	
Galvanized	2,000
Black	150
Bethlehem Steel Co.	
Black	380
Lukens Steel Co.	
Black	480
Jones & Laughlin Steel Corpn.	
Black	240
Central Iron & Steel Co.	
Black	60
Alan Wood Steel Co.	
Black	40

The Coast Guard has awarded submarine cable requirements as follows: Simplex Wire & Cable Co., Cambridge, Mass., 115,000 ft., $39,330; American Steel & Wire Co., 95,000 ft., $38,705; Okonite Co., Passaic, N. J., 105,000 ft., $35,895; General Cable Co., 110,000 ft., $32,860.

Hearing on Pipe Nipple Manufacturers' Code

WASHINGTON, Sept. 26. — Hearings were held today on the code of fair competition submitted to the National Recovery Administration by the National Association of Pipe Nipple Manufacturers. Deputy Administrator Malcom Muir presided. The code fixes the maximum work week at 40 hr. and not more than 8 hr. in any one day, except for the supervisory staff, office force and salesmen now receiving more than $35 a week. The minimum hourly wage is 40c.

The code provides that in determining occupational classification employees shall be entitled to claim the benefits of classifications existing on June 16, 1933 (effective date of the Recovery Act), and that the amount of difference existing on that date between the wage rates paid different classifications of employees receiving more than the minimum wage established by the code shall not be diminished.

Motor Car Production 236,480 Units in Aug.

WASHINGTON, Sept. 26.—Reflecting a gain of 3392, motor vehicle production in the United States in August rose to 236,480 units from 233,088 in July, according to the Bureau of the Census. The increase was almost entirely in the motor truck output, which rose 3271 to a total of 41,336. Passenger car output increased only 57 units to a total of 195,070. Taxicab production was 68 against 4.

In the first eight months of the current year motor vehicle production in the United States aggregated 1,476,678, an increase of 405,762 over the corresponding period of 1932. Passenger car output, totaling 1,238,012, represented a gain of 336,678. Motor truck production at 237,277, showed a gain of 2090.

Canadian motor vehicle production in August declined to 6079 from 6540 in July and consisted of 4919 passenger cars and 1160 trucks.

Steel Boiler Bookings Higher in August

WASHINGTON, Sept. 26.—Orders were booked in August for 511 steel boilers, having a total of 994,053 sq. ft., the largest square footage that has been placed in any single month since January, 1931. July booking totaled 498 boilers with 611,260 sq. ft. For the first eight months of the current year 2,649 boilers with 3,366,412 sq. ft. was booked, comparing with 2,314 boilers with 2,330,171 sq. ft. in the corresponding period of last year.

I. C. C. Rules On Extra Length Steel Shipments

WASHINGTON, Sept. 26.—The Interstate Commerce Commission has found not justified a proposed rule of railroads to furnish two cars in lieu of one ordered for shipments of iron and steel articles of unusual length between points in southern territory. It ordered cancellation of tariffs proposing the rule. In doing so, however, it suggested an alternative plan which, it was said, the Commission did not think would be unlawful.

The carriers were authorized to file new tariffs providing that when they cannot furnish promptly a single flat or gondola car of the length needed for the shipment of iron and steel articles two shorter cars will be furnished. The freight charges would be such as would have accrued had the shipment been loaded on a single car. The proposal carries a limitation that the rule would not apply to articles of such length as may not be loaded on a single 65-ft. gondola car, nor on a single 52-ft. flat car. The proposed rule of the carriers was to assess the same charges for two cars as would be applicable to a car of the length ordered by the shipper, except for cars exceeding 55-ft. in length.

Carriers in official territory and shippers of iron and steel in the Pittsburgh district protested against the proposed rule. They contended the schedules violated a rule providing that when a carload shipment requires, on account of length, two or more open cars, the minimum weight to be charged for the series of cars shall be determined on the minimum weight prescribed for a single car, plus 24,000-lb. for each additional car used. The report showed that southern carriers frequently had to borrow long cars from northern carriers to transport long lengths of steel with resulting loss in revenue.

Shipbuilders' Advisory Committee Enlarged

WASHINGTON, Sept. 26. — Complying with a request of the shipbuilders and ship repairers, and at the suggestion of the Secretary of the Navy, President Roosevelt has modified the shipbuilding code so as to provide for a committee of six members of the industry and four members without vote to be appointed by the President to cooperate with the National Recovery Administrator for administration of the code. Originally the code provided for a committee of five representatives of the industry and three members without vote to be named by the President.

Contention was made by the shipbuilders and ship repairers that as the geographical distribution of the industry is so great a committee of six members of the industry, instead of five, could best function in performing the duties imposed. It was also suggested that at a later date an additional increase might be sought to take care of the Mississippi River and its tributaries. The Secretary of the Navy pointed out that since the operation of the code would have an important bearing on Naval construction, it was desired that the Navy Department be represented on the committee.

The four members appointed by the President are: Robert L. Hague, industrial and consumer adviser; Joseph S. McDonagh, labor adviser; William H. Davis, National Recovery Administration Deputy, and Capt. Henry Williams, proposed by the Secretary of the Navy.

Mr. Hague is vice-president of the Standard Shipbuilding Co., New York. Mr. McDonagh is an official of the International Brotherhood of Electrical Workers.

Naval Air Station Gets P. W. A. Allotment

WASHINGTON, Sept. 26. — The Public Works Administration has allotted $1,010,000 for the construction of permanent buildings at the Correy field, Naval air station, Pensacola, Fla. Bids have already been invited for the various portions of the work to be done by the Bureau of Yards and Docks, Navy Department. The work will include the erection of modern hangars, an administration building, a barracks and mess hall building, a heating plant, an industrial building, a recreation building, together with necessary roads and pavements, etc.

An allotment of $971,550 for construction by the Biological Survey, Department of Agriculture, has been made. Of the total $752,200 will go for improvements and developments on animal experiment stations, bird and game refuges in many States. For construction of special types of boats for patrol work in enforcement and administration of the Migratory Bird Treaty Act a total of $34,650 will be spent. The balance, $184,700, will go for floats, docks, storehouses and other improvements for the Alaska Game Commission used in enforcement of the Alaska game law.

Public Works To Be in Full Swing by Winter

WASHINGTON, Sept. 26. — Appeals made last week by President Roosevelt and Public Works Administrator Ickes to mayors at their meeting in Chicago are expected to further stimulate loans for public works. The Roosevelt administration is exerting every possible effort to provide funds as rapidly as possible, consistent with requirements of the law.

Reports coming to Washington indicate, however, that orders for steel and other requirements in connection with the public works program are beginning to reach makers. It is believed that the movement will increase with considerable rapidity so that by the time winter sets in there will be a marked gain in employment and in business arising from the program.

The largest of 16 non-federal allotments made last week was one of $8,990,000 for sewage system in Cleveland. The total for the 16 projects was $9,739,000.

Malleable and Fabricated Metal Codes

WASHINGTON, Sept. 26.—Deputy Administrator H. O. King will preside at hearings on codes of fair competition for the malleable iron industry and the fabricated metal products industry. Hearing on the former will be held Oct. 2, while hearing on the fabricated metal products industry will take place Oct. 5.

The malleable iron code, presented by the Malleable Foundries Society, sets a maximum work-week of 40 hr. for molders, with a peak of 48 hr. not to exceed six weeks in any six months. It calls for not more than six days in any one week, provided that, if there is no official qualified labor in any locality, the hours, with the approval of the administrator, may be increased to meet requirements. The code also provides for Northern and Southern districts, with a rate of 40c. an hour for male workers in the former and 30c. in the latter district.

The code for the fabricated metal products industry, submitted by the Fabricated Metal Products Mfg. Co., was published in THE IRON AGE of Sept. 7. It provides a wage rate of 35c. an hour and a 40-hr. week, with 48 hr. for rush periods, for male processing employees.

Babbitt Metal Output Best Since Early 1931

WASHINGTON, Sept. 26. — The highest since January, 1931, production of babbitt metal in August totaled 2,753,661 lb., an increase of 268,669 lb. over July, according to reports received by the Bureau of the Census from 39 manufacturers. The August output was only 55,839 lb. under that of January, 1931. Production in the first eight months of the current year was 14,880,037 lb., compared with 11,595,857 lb. in the corresponding period of last year.

... PERSONALS ...

P. J. FLAHERTY, president of the Johnson Bronze Co., New Castle, Pa., has been elected president and chairman of the executive committee of the Cast Bronze Bushing Institute. Serving with Mr. Flaherty on the executive committee are F. I. Boles, general manager, Kendrick Mfg. Co., Detroit, vice-chairman, and K. D. McDonald, president, Buckeye Brass Mfg. Co., Cleveland, treasurer.

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FRANK M. DAVIS, president, Davis & Thompson Co., Milwaukee, manufacturer of machine tools and specializing in automotive equipment, has returned from Europe, where he spent the summer motoring in the British Isles.

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FRANKLIN G. SMITH, president of Osborn Mfg. Co., has been elected director of the Foundry Equipment Manufacturers' Association. This association has prepared and filed a code under the NRA covering the manufacture and sale of foundry machinery and equipment.

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F. C. REED has been appointed sales representative for New England by the Eastern Rolling Mill Co., Baltimore, Md., and will be located at Springfield, Mass.

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GILBERT L. YETTER, formerly materials engineer in the Bureau of Construction and Repair, Navy Department, has been appointed welding engineer for the Bureau of Reclamation, Department of the Interior, assigned to Boulder Canyon. Mr. Yetter is supervising the inspection of the fabrication of the welded steel penstocks being manufactured for the project.

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LEWIS J. FIRTH, president and director of the Firth-Sterling Steel Co., McKeesport, Pa., has been elected chairman of the board. He has been a director of the company since it took over the Sterling Steel Co. in 1897, and president for the past 34 years. THOMAS D. MCCLOSKEY has been elected vice-chairman and attorney; L. GERALD FIRTH, formerly general manager, succeeds his father as president; DONALD G. CLARK, formerly director of sales, has been made vice-president; JAMES W. KINNEAR, JR., has been made director to succeed EBEN B. CLARKE, who has retired from the board and vice-presidency; A. B. CORBIN, general manager of the Globe Wire Co., subsidiary of the Firth-Sterling Steel Co., has been appointed sales manager of the latter concern. DAVID E. JACKMAN and E. D. GRAY have been reelected treasurer and secretary, respectively.

P. J. FLAHERTY

LEE BERTHOLD, formerly general sales manager of the Louden Machinery Co., where he directed the design and marketing of industrial monorail equipment, has been appointed sales promotion and advertising manager of the Johnson Bronze Co., New Castle, Pa.

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JAMES T. CASTLE, 424 First Avenue, Pittsburgh, has become district representative for western Pennsylvania, northern West Virginia and the border counties of Ohio by Roots-Connersville - Wilbraham, Connersville, Ind., manufacturers of blowers, pumps, meters. Both Mr. Castle and D. J. MCCONNELL, who is associated with him, have had many years of experience in selling machinery of this type in the Pittsburgh area.

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HERMAN LADENSON, Ladenson Metals Corpn., Philadelphia, was elected temporary president of the Philadelphia chapter of the National Scrap Metal Dealers Association, at a meeting of Philadelphia dealers on Sept. 19. A. PEREZ, A. Perez & Son, Inc., Philadelphia, was named vice-president and JOHN FITZPATRICK, Joseph Rosenthal & Sons, Inc., Philadelphia, secretary.

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SIR ROBERT HADFIELD has just made a gift of £5,000 to the University of Sheffield in commemoration of the visit of the Iron and Steel Institute to Sheffield in 1905, when he was president, and of the visit of the institute to Sheffield this September. Sir Robert suggests that the money might be employed in some way in advancing metallurgical knowledge. He is head of the famous Sheffield steel company bearing his name and is a doctor of metallurgy of Sheffield University. He built and equipped one of the fine metallurgical research laboratories at the applied science department of the university.

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DONALD J. REESE has been appointed manager of the foundry equipment division of Whiting Corpn., Harvey, Ill. Mr. Reese has been in the employ of the Whiting organization since 1920, and for several years was in active charge of the gray iron and steel foundry at the Harvey plant. He is a graduate of the University of Michigan and has given special study to foundry and general metallurgical subjects. Besides direct contact with practical foundry problems for many years, including extensive field work, he spent some time in Germany in connection with the development of the rotating pulverized-coal fired furnace. He is a member of the American Foundrymen's Association. Mr. Reese has also been very active in local foundry circles and is at present vice-president of the Chicago Foundrymen's Club.

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E. C. RICE has been appointed manager of the crane division of the Whiting Corpn., Harvey, Ill. Soon after graduation from Ohio Northern University in 1920, Mr. Rice entered the employ of the Whiting Corpn. as a special apprentice and after thorough training in shop practice, became connected with the estimating and engineering departments, specializing on cranes and special machinery for power plants, dams, flood control and other projects.

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GORDON FOX, who has been associated with the Leningrad staff of the Freyn Engineering Co., Chicago, has returned to the United States and will resume his connection with the American activities of the company. He has devoted the last five years to engineering work in the Soviet Union for the Freyn company.

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CARL G. OHLSON has joined the staff of the Aetna-Standard Engineering Co., Youngstown, as vice-president in charge of engineering. For the past three years he has been identified with the Morgan Construction Co., Worcester, Mass., and previous to that was with the Youngstown Sheet & Tube Co., Youngstown.

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B. A. JOHNSTON, formerly assistant sales manager for the Continental Tool Works division of the Ex-Cello Aircraft & Tool Corpn., has been appointed sales manager of the Swedish Gage Co. of America, Detroit.

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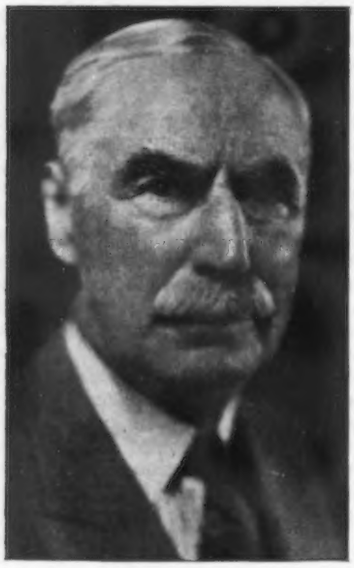
EDWIN H. KOTTNAUER has been made Pacific Coast representative, with offices at 1341 South Hope Street, Los Angeles, by the Climax Molybdenum Co., New York.

James A. Campbell Dead—Was Head of Youngstown Company Before Retirement



JAMES A. CAMPBELL

JAMES ANSON CAMPBELL, board chairman emeritus of the Youngstown Sheet & Tube Co., Youngstown, and prior to his partial retirement two years ago the dominating figure of the Mahoning Valley steel industry, died suddenly in his Youngstown home on Sept. 20. He was 79 years of age on Sept. 11, and his death closed a career of more than 40 years in the steel industry. He had been in poor health for many months, having begun to relinquish the active management of the company he had built up soon after the close of the Bethlehem-Youngstown merger suit in which he took an active part. For more than a generation, Mr. Campbell had been a member of that inner circle of the steel industry which included the late Judge Gary, Charles M. Schwab and others and to which the industry looked for leadership during its period of greatest expansion and prosperity. His contribution to that leadership was of inestimable value and included an early recognition of the rights of labor as well as a keen responsibility to common shareholders who were never deprived of dividends during his long tenure as president of the Sheet & Tube Company.

Mr. Campbell was born on a farm near Ohltown, Trumbull County, Ohio, and attended Hiram College. He entered the hardware business in Youngstown in which he was engaged for five years, later organizing the Youngstown Ice Co. His first experience in the iron and steel industry was gained with the Trumbull Iron Co., of which he became general superintendant in 1890. Seven years later he went with the Mahoning Valley Iron Co. in a similar capacity, and with the organization of the Republic Iron & Steel Co., in 1899, he became general manager of its Youngstown properties.

His identification with the Youngstown Sheet & Tube Co. dates from its inception in 1901. As one of the organizers, he became vice-president and general manager, serving in that capacity until he became president in 1903. During the next 25 years he saw the company expand its assets from $600,000 to nearly $300,000,000. A large part of this growth occurred in the early twenties, when the Brier Hill Steel Co., Youngstown, and the Steel Tube Co. of America, Chicago, were absorbed. The latter acquisition established the company in the Chicago district and further strengthened its position in the manufacture of pipe. It also did much to enhance the bargaining position of the Youngstown company in the various merger negotiations of 1929 and 1930, which culminated in the long enduring court battle between the Youngstown and Bethlehem companies and the Cyrus Eaton interests of Cleveland. In favoring the Bethlehem-Youngstown merger, Mr. Campbell believed that the interests of his stockholders would be better protected through a union of the two companies. The outcome of the case was a blow from which he never fully recovered. Soon afterwards he relinquished the presidency of the company to Frank Purnell, to become chairman of the board, and the following year saw his almost complete retirement to the honorary position of chairman emeritus.

During his long career in the industry Mr. Campbell was awarded most of the honors which it can bestow. As a director and vice-president of the American Iron and Steel Institute, he was active in the formation of its policies. A leader in the business life of Youngstown, he was also active in philanthropic work and had endeared himself to the employees of the company of which he was head as well as to all the citizens of the community.

W. S. Tower to Administer Steel Code as Executive Secretary of Institute

WALTER SHELDON TOWER, whose election as executive secretary of the American Iron and Steel Institute was announced by the directors on Sept. 20, brings to that organization an economic and commercial background which should prove invaluable in the administration of the industry's code of fair competition. In his recent position as manager of commercial research for the Bethlehem Steel Co., Bethlehem, Pa., he took an active part in the preparation of the code for submission to the National Industrial Recovery Administration, and during the brief period it has been in force, he has freely offered his services to the industry as a whole in the interpretation of its complexities. As the institute directors have made no plans to fill the position of president, recently made vacant by the resignation of Col. Robert P. Lamont, it is clearly evident that Mr. Tower has been assigned the difficult task of creating "the model organization of its kind," which, in the words of an NIRA spokesman, is expected of the American Iron and Steel Institute.

Although he is not a financier, a metallurgist nor an operating man, Mr. Tower has been identified with the steel industry since 1919 and has had an opportunity to view its advantages and shortcomings without bias. Born at West Bridgewater, Mass., on July 26, 1881, he was graduated from Harvard University in 1903, received his A.M. from that institution in the following year, and continued his studies at the University of Pennsylvania, which awarded him his Ph.D. in 1906. During the next few years, he further strengthened his economic background as a teacher of that subject in leading universities.

In 1918, Mr. Tower was made a trade adviser to the United States Shipping Board where he immediately demonstrated his commercial talents. He was designated to accompany the United States commission for the negotiation of the Treaty of Versailles, and upon his return, became associated with the Consolidated Steel Corpn., New York, an export organization, as trade adviser. In 1921 he served briefly as chief of the iron and steel division of the Department of Commerce, but was soon sent to London as commercial attaché to the American Embassy, where he remained until November, 1924. Since that time in the service of the Bethlehem Steel Co. he has had wide experience in the various commercial activities of the industry.

Advances in Heavy Rolled Steel Products Cause Rush to Cover at Old Prices

Higher Base Quotations, New Extras and Revised Contract Provisions Provide Impetus for Buying—Orders for 1,000,000 Tons of Rails in Prospect

THE launching of a Government-sponsored capital goods program, the speeding up of public works and a renewed wave of steel buying, set in motion by price advances, have put new life into a flagging market. At the same time the downward trend in steel production is less pronounced, with a rise of two points to 46 per cent of capacity at Chicago partially offsetting three-point declines to 29 per cent at Pittsburgh and to 72 per cent in the Wheeling district. The national average of ingot output, at 41 per cent, is identical with the rate of a fortnight ago and two points lower than the figure of last week.

THE chief disturbing feature in the iron and steel outlook is the fact that the continued upward movement of prices, forced by rising costs, has driven in business considerably in excess of consumers' present needs. Even the steel fabricating trade, which had long religiously restricted its purchases to steel requirements for specific projects, is now purchasing for stock.

The greatest current impetus to steel demand has been supplied by advances of $2 a ton on plates and shapes and $3 a ton on bars for the fourth quarter, which become effective Oct. 1. Covering at lower prices this week is heavy. Buyers are prompted to get under the wire not only on account of the advances in base quotations but also because of revised extras and more stringent contract terms which go into effect next Monday.

In stipulating that contracts for steel shall be as binding as contracts for pig iron and other materials, the mills are introducing a reform which has been attempted without success on various occasions in the past. As long ago as January, 1919, the directors of the American Iron and Steel Institute approved a form of sales contract of the type which has just been adopted. However, the means of enforcement now available under the code were not then at hand.

SCRAP shows further weakness throughout the country, and price declines at Chicago and Philadelphia have reduced THE IRON AGE composite for heavy melting steel from $11.17 to $11.04 per gross ton, the fourth consecutive recession since the last week in August. Notwithstanding this unfavorable augury, the trend of prices in other primary materials seems to be definitely upward. Labor disturbances in the western Pennsylvania coal mines have become chronic and on Oct. 2 code wage scales will become effective, which will make higher fuel prices inevitable.

THE IRON AGE composite price for pig iron is unchanged at $16.71 a gross ton, but the finished steel composite has risen from 1.979c. to 1.992c. a lb., with a further advance due next week when fourth quarter prices on heavy rolled products go into effect.

As distinguished from billet steel merchant bars, both billet steel and rail steel reinforcing bars are unchanged from prices recently announced. Rail steel merchant bars, however, have been advanced $3 a ton, effective Oct. 2.

THE steel industry is still making adjustments in selling practices to make its code workable. It has given in to the pressure of the automobile industry for a modification of the code stipulation that all-rail freight rates be charged on all shipments of iron and steel, and has arbitrarily fixed freight charges to Detroit at 15c. per 100 lb. on merchant steel bars and 20c. on hot-rolled strip and sheets.

Southern producers' differential of 38c. a ton under delivered prices on Northern pig iron has been restored after having been canceled.

Arbitrary switching charges of 50c. per net or gross ton have been established at all pig iron and steel basing points except Chicago, where the arbitrary will be 60c.

THE Government's capital goods program was brought nearer to realization by a conference between rail makers and President Roosevelt at Washington on Monday. Close to 1,000,000 tons of rails are reported to be ready to be placed upon the submission of satisfactory competitive bids. Steel companies did not bind themselves to reduce the present rail price of $40 a ton but it is understood that a concession of possibly $2 a ton may be made.

The rail program is expected to be followed by Government-sponsored purchases of railroad equipment.

Public works continue to loom up as an increasingly important prospective source of tonnage. New structural steel projects, most of them of a public character, total 29,350 tons compared with 14,500 tons last week and 24,500 tons a fortnight ago. Structural steel awards, mostly in small tonnages, aggregate 10,100 tons, the largest total since the first week of August.

Iron and steel exports in August rose to 119,374 tons from 88,311 tons in July. The principal increase was in the scrap movement. August imports, 46,839 tons, underwent a decline of 5966 tons from the July total.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Sept. 26, 1933	Sept. 19, 1933	Aug. 29, 1933	Sept. 27, 1932
Per Gross Ton:				
No. 2 fdy., Philadelphia	$18.34	$18.34	$18.34	$13.84
No. 2, Valley furnace	17.50	17.50	17.50	14.50
No. 2 Southern, Cin'ti	18.23	18.23	18.23	13.82
No. 2, Birmingham	13.50	13.50	13.50	11.00
No. 2 foundry, Chicago*	17.50	17.50	17.50	15.50
Basic, del'd eastern Pa	17.84	17.84	17.84	13.50
Basic, Valley furnace	17.00	17.00	17.00	13.50
Valley Bessemer, del'd P'gh	19.89	19.89	19.89	16.89
Malleable, Chicago*	17.50	17.50	17.50	15.50
Malleable, Valley	17.50	17.50	17.50	14.50
L. S. charcoal, Chicago	23.67	23.67	23.17	23.17
Ferromanganese, seab'd carlots	82.00	82.00	82.00	68.00

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$40.00	$40.00	$40.00	$43.00
Light rails at mill	32.00	32.00	30.00	32.00
Rerolling billets, Pittsburgh	26.00	26.00	26.00	26.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	26.00
Slabs, Pittsburgh	26.00	26.00	26.00	26.00
Forging billets, Pittsburgh	31.00	31.00	31.00	33.00
Wire rods, Pittsburgh	35.00	35.00	35.00	37.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.60

Finished Steel

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.60	1.60	1.60	1.60
Bars, Chicago	1.65	1.65	1.65	1.70
Bars, Cleveland	1.65	1.65	1.65	1.65
Bars, New York	1.95	1.95	1.95	1.95
Tank plates, Pittsburgh	1.60	1.60	1.60	1.60
Tank plates, Chicago	1.65	1.65	1.65	1.70
Tank plates, New York	1.898	1.898	1.898	1.898
Structural shapes, P'gh	1.60	1.60	1.60	1.60
Structural shapes, Chicago	1.65	1.65	1.65	1.70
Structural shapes, New York	1.86775	1.86775	1.86775	1.86775
Cold-finished bars, P'gh	1.95	1.95	1.95	1.70
Hot-rolled strips, Pittsburgh	**1.75**	1.65	1.65	1.45
Cold-rolled strips, Pittsburgh	**2.40**	2.25	2.25	1.90

Finished Steel

Per Lb. to Large Buyers:	Sept. 26, 1933 Cents	Sept. 19, 1933 Cents	Aug. 29, 1933 Cents	Sept. 27, 1932 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.25	2.25	2.25	2.10
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.35	2.35	2.35	2.20
Sheets, galv., No. 24, P'gh	2.85	2.85	2.85	2.75
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.85
Hot-rolled sheets, No. 10, P'gh	**1.75**	1.65	1.65	1.55
Hot-rolled sheets, No. 10, Chicago dist. mill	**1.85**	1.75	1.75	1.65
Wire nails, Pittsburgh	2.10	2.10	2.10	1.95
Wire nails, Chicago dist. mill	2.15	2.15	2.15	2.00
Plain wire, Pittsburgh	2.10	2.10	2.10	2.20
Plain wire, Chicago dist. mill	2.15	2.15	2.15	2.25
Barbed wire, galv., Pittsburgh	2.60	2.60	2.60	2.60
Barbed wire, galv., Chicago dist. mill	2.65	2.65	2.65	2.65
Tin plate, 100 lb. box, P'gh	$4.65	$4.65	$4.25	$4.75

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$12.75	$12.75	$13.75	$9.75
Heavy melting steel, Phila.	*10.75*	11.00	12.00	7.25
Heavy melting steel, Ch'go	*9.62½*	9.75	10.25	6.25
Carwheels, Chicago	10.00	10.00	10.50	7.00
Carwheels, Philadelphia	12.75	12.75	12.75	10.00
No. 1 cast, Pittsburgh	11.75	11.75	11.75	10.00
No. 1 cast, Philadelphia	12.50	12.50	12.50	9.50
No. 1 cast, Ch'go (net ton)	10.00	10.00	10.50	6.25
No. 1 RR. wrot., Phila	12.00	12.00	12.00	7.50
No 1 RR. wrot., Ch'go (net)	8.50	8.50	9.00	5.50

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$2.50	$2.50	$2.50	$2.00
Foundry coke, prompt	3.25	3.25	3.25	2.75

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery	8.75	8.75	8.75	6.00
Lake copper, New York	9.00	9.00	9.00	6.37½
Tin (Straits), New York	*47.20*	47.95	46.12½	24.50
Zinc, East St. Louis	4.75	4.75	4.75	3.25
Zinc, New York	5.12	5.12	5.12	3.62
Lead, St. Louis	4.35	4.35	4.35	3.25
Lead, New York	4.50	4.50	4.50	3.30
Antimony (Asiatic), N. Y.	**7.00**	6.75	6.87½	5.62½

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

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▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
Sept. 26, 1933	1.992c. a Lb.	$16.71 a Gross Ton	$11.04 a Gross Ton
One week ago	1.979c.	16.71	11.17
One month ago	1.979c.	16.71	12.00
One year ago	1.965c.	13.64	7.75
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1933	1.992c., Sept. 26	1.867c., Apr. 18	$16.71, Aug. 29	$13.56; Jan. 3	$12.25, Aug. 8	$6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.42, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.037c., Jan. 14	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25; Jan. 11	13.08, Nov. 22

Pittsburgh and Wheeling Rates Drop Further—Valleys Holding

Late Quarterly Specifications Fairly Large With Price Advance on Heavy Hot-Rolled Products — Labor Trouble Continues

PITTSBURGH, Sept. 26.—The final week in the third quarter will mark the cleaning up of old low-price contracts. Local steel offices have begun to enjoy a quickening of specifying in anticipation of higher prices for fourth quarter. All tonnage thus specified, however, must be taken out by consumers. The inflow of specifications during the current week is expected to be of sufficient proportions to instill new life into the local steel industry, which, for the greater part of September, has ben concerned almost entirely with the prodigious task of adjusting itself to new conditions growing out of codification.

The turn of the month will usher in higher prices on several steel products. Effective Sept. 30, hot-rolled bars will be advanced $3 a ton and plates and shapes will be marked up $2 a ton. Hot-rolled sheets, No. 10 gage, have already been advanced $2 a ton to 1.75c., Pittsburgh. Although advances of $2 a ton on hot-rolled strip and $3 a ton on cold-rolled strip became nominally effective on Sept. 15, some producers' books still are open for acceptance of tonnage at previous quotations for delivery prior to Oct. 15, so that the new prices will not be definitely established until Oct. 1. No announcement of fourth quarter schedules on cold-finished bars has been made, but an advance is considered likely in order to maintain a differential between hot-rolled and cold-finished bars.

With the steel industry gradually orienting itself to code details, producers are measuring business prospects for the remainder of the year. The bright spot for makers of heavy steel products is the prospective coaction of the Government and carriers in covering for rails. The conference at Washington yesterday is held to have paved the way for early crystallization of rail buying, although the volume of business in the offing has not yet been definitely stated. The outlook for other heavy products is momentarily obscure, but Federal releases of public works projects are in better evidence.

In the light-rolled group, miscellaneous demand has already shown a marked improvement. Demand from the automotive industry, however, has tapered off further. Although a few makers have placed trial orders for sheets for next year's models, demand will probably remain extremely light until late in the fall when production on new cars will become general. Strip steel is in good demand from various sources. Seamless tubing is also more active. Line pipe and oil country goods, however, are very sluggish.

Specifications for tin plate have begun to lessen, but mills are generally booked at capacity until the end of October. A leading tin plate producer has scheduled operations at 15 turns in adjustment with the 44-hr. week under the code.

Steel ingot production in the Pittsburgh district this week is scheduled at approximately 29 per cent of capacity, a loss of three points since last week. Production in the Valleys and nearby northern Ohio mills is unchanged at 48 per cent. Output in the Wheeling district is off three points to 72 per cent. Three blast furnaces in the Pittsburgh area were taken off last week.

Prime materials markets are very quiet. Labor disturbances in the fuel regions continue, but early settlement is considered likely when higher wages become effective.

Pig Iron

With current quotations expected to remain unchanged through the fourth quarter, consumers are not inclined to consider forward requirements. Most of the important basic consumers are covered for their immediate needs, although some forward buying from that quarter is considered likely in the next several weeks. Demand from the foundry trade is practically dormant. A slight improvement in ingot mold orders is noticeable, but it has not yet been reflected in increased pig iron demand from ingot makers. Shipments against third quarter contracts are practically completed, and aggregate deliveries in September are expected to fall about 30 per cent below the August total.

Semi-Finished Steel

Shipments have slackened further. With mill operating schedules somewhat uncertain for next quarter, forward interest in semi-finished products is negligible. Sheet bars still are in good demand, but billets, slabs, wire rods and forging billets are relatively quiet. Current prices are unchanged for shipment through fourth quarter. Effective Oct. 1, freight rates on sheet bars and slabs from Cleveland will be revised. The sheet bar rate from Cleveland to Pittsburgh will be $2.52 a ton; this rate will be applicable also to Carnegie, Pa., Martins Ferry, Ohio, and Wheeling, W. Va. The $1.64 rate on sheet bars from Cleveland to Canton, Ohio, will remain unchanged. The new rate on slabs from Cleveland to Detroit will be $2.62.

Bars, Plates and Shapes

Effective Sept. 30, bars will be advanced $3 a ton to 1.75c., and plates and shapes $2 a ton to 1.70c., Pittsburgh, for fourth quarter delivery. Wide flange material will be advanced to 1.80c., Pittsburgh. New contract forms are being considered for fourth quarter tonnage and probably will be adopted this week. Four types are being contemplated. These provide for coverage for a specified quantity; provisional coverage, permitting consumer to specify 25 per cent above specified tonnage; agreement of consumer to accept a definite percentage of maximum requirements for the delivery period, and blanket order for requirements of a specific project, with 60-day protection of price. Although the advances, to become effective Sept. 30, will undoubtedly drive in some tonnage this week at the 1.60c. price, all such tonnage ordered must, under the code, be taken by consumers to escape the penalty clause for unspecified tonnage which cannot be cancelled except for a consideration. The volume of anticipatory covering is therefore not expected to expand as sharply as might be expected in a similar situation without code restrictions.

New billet reinforcing steel is unchanged at 1.80c., Pittsburgh, for stock lengths as quoted by distributers; for cutting to length 60-in. and over, the price takes an extra of 10c. per 100 lb. Rail steel reinforcing bars will be carried into fourth quarter at 1.75c., Pittsburgh. Under the code, makers of reinforcing steel are permitted to protect fabricators at present quotations on the blanket requirements of a specific project for 60 days, from Sept. 30, provided bids are opened not later than Oct. 5.

New structural and reinforcing projects are light, and recent awards unimportant from a tonnage standpoint. Plates are very quiet, with new tank work and barge construction extremely light.

Rails and Track Accessories

Miscellaneous fourth quarter requirements of a number of carriers are being figured, and a fair aggregate tonnage is expected to be placed by the end of the week. The Chesapeake & Ohio has spread orders among many producers for about 7500 tons of tie plates, spikes and other accessories. The local rail mill

did not participate in the New York Central order for about 8200 tons of rails. Other steel requirements of the carriers are slowly taking definite shape, and some concerted buying is expected before winter.

Wire Products

This market is very drab. The current run of bookings is light, and forward interest is lacking. Mill backlogs are consequently being diminished rapidly, and operations continue to recede, the current rate barely averaging 60 per cent of capacity. Base prices are unchanged.

Sheets

With practically all third quarter specifications in, no measurable increase in specifying is expected this week. A few contracts have been entered for fourth quarter, but forward covering cannot be termed as significant. Several automobile makers have ordered sheets to meet the last requirements of production on 1933 models. Few motor car manufacturers are actively engaged on new models, and forward interest is still largely limited to trial sheets. Miscellaneous sheet demand is rather spotty. Sheet mills continue to operate at barely 50 per cent of capacity.

Tubular Goods

Demand for seamless tubing showed some improvement in the past week. Carlot orders for locomotive boiler tubes and superheater flues are more frequent. Brisk movement of mechanical tubing out of distributor's stocks is causing some replenishment buying. Although new orders from the automobile makers have not increased, interest in that quarter is spreading and some fairly sizable business is in prospect for placement when new models are scheduled. Line pipe and oil country goods are very quiet.

Cold-Finished Bars

Although fourth quarter prices have not yet been announced, it is probable that, with hot-rolled bars to be increased $3 a ton on Sept. 30, relative advance on cold-finished bars will follow sometime in October. Current business is unusually light. Specifications from the automobile and parts makers are decreasing, and demand from jobbers has also fallen off.

Tin Plate

Specifications show signs of slackening. Mills are booked until the end of October, and, with consumers expected to specify fully against present contracts, capacity operations may be necessary well into November. Some consumers, following completion of existing orders, may resort to stocking toward the close of the year, if a higher price for next year is announced. The current quotation of $4.65 per base box, Pittsburgh, has attracted very little spot buying. The sharply higher producing costs are held to foreshadow an even higher price for 1934. Next year's quotation will probably not be announced until Nov. 15, when specifying for January delivery usually begins.

Strip Steel

Although most new business entered since Sept. 15 has been at 1.75c., Pittsburgh, for hot-rolled, and 2.40c., Pittsburgh, for cold-rolled, some mills are still accepting specifications against old lower-priced contracts until Sept. 30 for delivery by Oct. 15. Miscellaneous orders in the past week were in good volume, while calls from the automotive industry continued to lag. The current week is expected to bring in a substantial amount of business in anticipation of definite establishment of prices at the new levels on Oct. 1.

Coke and Coal

With a general "holiday" still in effect in the Connellsville district, fuel markets have remained at a standstill in the past week. No offerings of coke or coal were in evidence, nor was there any pressure from consumers for fuel. Prices have consequently remained stationary. With most miners expected to return to work on Oct. 2, when higher wage scales will become generally effective, some upward revision in prices seems inevitable. Meanwhile, spot furnace coke is nominally quotable at $2.50 to $2.75, ovens. Prompt foundry coke is quoted at $3.25, while premium brands are priced at $4.50, ovens.

Scrap

Scrap consumers continue to withhold interest. Buying is consequently restricted to small-lot distress material. In the absence of significant transactions, No. 1 heavy melting steel is quotably unchanged at $12.50 to $13.00. Although prices have resisted decline in the past week, present quotations cannot be termed as firm. The market for the heavy melting steel grades, however, has undoubtedly been bolstered by withdrawals from Eastern supplies for export. On a recent sale, heavy breakable cast has been established 50c. a ton higher at $11 to $11.50. No. 1 cast also reflects firmness. Mill acceptances against orders are becoming more frequent, but deferments in one or two cases are still in effect.

Public Works Loom Larger on Coast

SAN FRANCISCO, Sept. 25.—Decisions on several outstanding projects are due at the coming elections in November. Sacramento will vote on bonds for the $11,700,000 Silver Creek project, which calls for upward of 25,000 tons of steel. San Francisco will decide on the Newark transmission line, which will require approximately 1600 tons of structural steel. A State referendum in California must sanction the Kenneth Dam project, which would call for at least 5000 tons of structural steel in the transmission line alone. The Public Works Administration has made an allotment of $1,500,000 to Salem, Ore., for a water system which will include 30 miles of pipe line, probably of steel.

During the week a greater number of structural steel awards were reported than for any other week during 1933. These lettings aggregated 4561 tons. New projects listed will require 13,482 tons of structural steel. Among new inquiries were 3000 tons Sound Navy Yard and 2000 tons for the Hall of Records in Oakland, Cal.

Reinforcing bar bookings totaled 958 tons, while new projects included 483 tons for highway construction that has just been advertised.

Although new inquiries have been limited, the allotment of funds for military bases and for municipal projects is indicative of fall and winter activity.

Buffalo Output Holds Recent Gain

BUFFALO, Sept. 26.—Steel output is being maintained, with the Lackawanna plant of the Bethlehem Steel Corpn. operating nine open-hearths, the Republic Steel Corpn., six open-hearths, and Wickwire-Spencer Corpn. two open-hearths. The Seneca sheet division of Bethlehem continues to run at an 80 per cent rate. No important structural fabricating awards have been reported. September warehouse business to date is equivalent to that of June, July and August for corresponding periods.

The pig iron market has become quieter. Releases are fair, but shipments are due to lag behind last month's total. The largest inquiry out now is one for 200 tons of foundry iron. Foundry melt has declined. Producers hope that the recent inquiry of the New York Central for 75 tons of foundry iron and the comparatively recent order placed by the Baltimore & Ohio for a small tonnage of high manganese iron are auguries of greater activity in railroad repair shops.

Scrap

The market is softer with a minimum of buying. The principal transactions were a couple of sales of No. 2 melting steel, of approximately 500 tons apiece, at $9. It is reported that one of these transactions included a small lot of No. 1 heavy melting steel at $10. Some sales of No. 1 machinery cast are reported at $11.50.

Steel Output in Further Rise in Chicago District

Ingot Rate Now 46 Per Cent as Buyers Rush to Cover — Uniform Switching Charge Fixed — Melting Scrap Off 25c. a Ton

CHICAGO, Sept. 26.—Ingot output has advanced two points to 46 per cent of capacity, thereby registering a gain for the second consecutive week. It is doubtful if actual consumption of steel has gained six points in two weeks, because there is distinct disposition on the part of buyers to lay in stocks, especially in cases where old commitments are about to expire, such as is the case with sheets that are still due automobile manufacturers.

This inclination to stock steel has spread to structural steel fabricators, who discontinued the practice several years ago. New buying of steel mill products is gaining appreciably as users rush to cover on plates, shapes and bars before prices advance Oct. 1. Here again fabricators enter the picture, reviving an old practice they spurned earlier in the year. Until now they had rather firmly entrenched themselves on the basis of buying steel for specific jobs.

Numerous Western railroads are ready to place rail contracts as soon as a price agreement is reached. The probable requirements of all railroads will exceed 600,000 tons.

In order to clarify the burden of figuring delivered prices in the Chicago switching district, sellers of iron and steel have decided to apply an average switching charge of 60c. a ton. This move is designed to avoid confusion when shipments are made to Chicago by producers outside of this district and also to avoid discussion where a Chicago user buys for several of his plants located in the switching district but taking different switching charges.

Heavy melting steel has sold off 25c. a ton under the pressure of distress scrap that continues to trouble this market.

Pig Iron

Sales of Northern foundry iron remain in fair volume and shipments for September will be practically equal to the August volume. Releases for October delivery point to a heavier movement in the coming month. Sellers are applying a flat switching charge of 60c. a ton when figuring delivered prices in the switching district.

Cast Iron Pipe

Engineers' offices are bristling with plans, now well finished. The one stumbling block is the fact that Government funds have been made available at only a few points. Evanston, Ill., plans extension to its water plant, and Eau Claire, Wis., now has money available to start its project requiring 1500 tons of pipe. If surcharges are dropped Oct. 1, the freight rate on cast iron pipe from Birmingham to Chicago will be lowered 40c. to $8 a net ton.

Reinforcing Bars

There is no material change in this market and most shipments are against old commitments, the result being a steady shrinkage of backlogs. Inquiries for small tonnages are more numerous. The State of Indiana has placed about 900 tons, awards having been made to a number of fabricators. Outstanding among fresh inquiries is 800 tons for a bridge near Cairo, Ill. Illinois road work still drags, but satisfactory headway is being made with highway programs in Wisconsin.

Rails and Track Supplies

Although no firm inquiries are before the trade, the rail requirements of the railroads are expected to be made known soon. That the carriers are expecting lower prices is evident from the statement of one railroad executive that orders for 35,000 tons will be placed as soon as satisfactory terms are agreed upon. Chicago mills are getting larger releases against old commitments, which, combined with the Chesapeake & Ohio rails, are resulting in the best rail output in about three months. Light rails, priced at $32 a ton, find few users.

Plates

Prices have been filed to take effect at the end of the month, raising the market $2 a ton, to 1.75c. a lb., Chicago or Gary. During the closing days of September third quarter books remain open at 1.65c., but sellers are insisting that deliveries on tonnages taken at that price be strictly in accordance with the convenience of mills.

Demand for plates remains variable and sellers must look to many sources for such tonnages as are being booked. Railroad equipment is playing a more important part in the market. The Minneapolis-Moline Power Implement Co. is buying 400 tons for railroad car underframes which it will build, and Inland Steel Co. has ordered 12 flat cars. Major repairs to railroad equipment are light and little steel is being bought for this purpose. Evanston, Ill., is planning extensions to its water system and will build a large steel tank.

Structural Shapes

Prices will be advanced $2 a ton, effective at the end of the month. The Chicago price will then be 1.75c. a lb. Both inquiries and lettings are lighter than the tonnages which reached the trade a week ago, but fabricators report that their lists of accumulated inquiries are the longest they have had since early summer. Fully 75 per cent of the jobs now open represent the expenditure of public money, most of which is being supplied by the Federal Government.

Bars

Prices for third quarter will be advanced $3 a ton effective at the end of the month. Mild steel bars, which are now quoted 1.65c. a lb., will then be priced at 1.80c. a lb. Shipments to automobile manufacturers are slightly lighter, but October schedules are now being entered and they indicate motor car building in the coming month at about the rate in September. Agricultural implement manufacturers are busier on repair parts. It is quite evident that the farm program has not produced the desired results and orders for farm machinery remain light.

Wire Products

This market remains on an even keel, with sellers generally of the opinion that October will witness an upturn in demand. Prices are unchanged, and so far as can be learned here no changes for October are on file. Both new buying and specifications remain on more or less of a week-to-week basis. However, inquiries are up because of figures that are being taken for estimating purposes in connection with contemplated changes in product design.

Sheets

Chicago mills are operating near capacity as a result of the desire of automobile manufacturers to take all possible tonnage against old contracts which automatically expire Oct. 15. Deliveries are now extended well toward the end of October and local mills are turning away business.

Scrap

Although the local scrap market is still stagnant, a consumer has taken a small lot of heavy melting steel at $9.75, which is 25c. a ton under quotations that had been prevailing. Dealers are steering a middle course, hesitating to take either a long or a short position. Their activity is centered in covering such old orders as they now have on hand. Railroad lists, recently offered, have been withdrawn, prices being unsatisfactory. A boatload of No. 2 busheling will leave Chicago in October.

Steel Buying is Slightly More Active in New York District

Bars, Plates and Shapes Advanced as Definite Contracting Agreements Are Introduced—Rail Price Reduction Is Likely

NEW YORK, Sept. 26.—Orders for finished steel products in this district have been slightly heavier in the last week, but confusion over the interpretation of contract agreements between mills and consumers has unquestionably held back some business which will be placed before the end of the month. The new contracting arrangements, which were introduced with the advance in bar, plate and shape prices last week, are designed to protect mills against cancellation of orders, price declines and other contingencies and to assure sellers that orders placed on books must definitely be taken out. Such contracts have been considered at various times in the past and at times have been placed in effect, only to be disregarded later. Under the code, the plan is expected to work out.

The new contracts offer four alternatives for the buyer. He may contract for a definite tonnage to be specified for shipment before the end of the quarter; he may buy a tonnage from which he may deviate up to 25 per cent or the mill down to 25 per cent; he may contract for a specified percentage of his requirements within a specified maximum, or he may get protection on definite identified jobs for 60 days. Small users are showing the most interest in the contract which provides for their coverage up to a specified maximum. If the full maximum is not taken out, the consumer is not required to make "suitable adjustment." The question also arises as to who is the judge of a "suitable adjustment." It is intimated that a new contract at a higher price might be satisfactory.

Higher prices on bars, plates and shapes were filed last week in sufficient time to become effective Oct. 1. Bars are now quoted at 1.75c., Pittsburgh, and 1.85c., Buffalo; plates at 1.80c., Coatesville, Pa., or Sparrows Point, Md., and shapes at 1.80c., Bethlehem. Mills are taking fourth quarter business at the old level, but strictly under the new contracting plan. No other price changes have been filed, other than those on hot-rolled sheets and strip steel which are now in full effect.

The promise of 1,000,000 tons of rails for rolling during the winter months if the present $40 a ton price is reduced is expected to lead to a drop of $2 or $3 a ton this week. On the other hand, if this tonnage is bought by the Government rather than by individual carriers, mills may consider the special circumstances and make only a temporary revision in price. Further railroad buying is in prospect, but the rail negotiations are expected to be completed first. Federal building projects in the district continue to lag, although the New York post office addition, on which bids were taken last spring, is being readvertised. Bids are not yet in on the cast iron segments and bolts required by the Thirty-eighth Street tunnel at New York. Tin plate specifications continue to lag and some mills are now in position to make October shipment.

Pig Iron

Foundry activity in this district shows a slight decline, but many Connecticut melters are still busy supplying castings for oil burners. Seasonal demand for furnace castings has not yet appeared. Consumers are displaying little interest in entering commitments for forward requirements, and current purchases continue to be limited to spot carlots. Bookings for the week totaled 2400 tons, as compared with 1900 tons for the preceding period, and 2300 tons two weeks ago. Open inquiry is negligible. A number of melters are not releasing against old contracts as liberally as during early September, although a few of the larger plants continue to anticipate shipments on old contracts. An advance in ferromanganese is expected when producers announce fourth quarter prices this week.

Reinforcing Steel

New Hampshire highway contractors have awarded 320 tons of road mesh to American Steel & Wire Co., for work in Belknap and Dublin Counties. Bar awards during the week were negligible. New York highway contractors will let additional tonnages of mesh during the week, and over 1400 tons of bars will be placed tomorrow for the Erie Railroad grade elimination at Elmira, N. Y. The bids of local distributers for the 4100 tons of bars required by the Bonnett Carie spillway bridge at New Orleans were considered too high, and the work is to be readvertised immediately.

Scrap

Two Pennsylvania mills have purchased 10,000 tons of No. 2 heavy melting steel from Philadelphia dealers and a strengthening of that grade in this district is noticed. Pittsburgh and eastern Pennsylvania mills continue to delay shipments on old contracts and are apparently uninterested in making fresh purchases of No. 1 heavy melting steel. Domestic demand in this district for all grades is light and no immediate revival of buying is expected. Price weakness has been forestalled by the export activity of local brokers. Sizable tonnages of heavy melting grades are being collected daily for Japanese and Italian consumers. Diversified export inquiry is appearing in this district, and brokers are making additional bookings. Export loadings are expected to continue for the next two months.

Buyers More Cautious in New England

BOSTON, Sept. 26.—Purchases of pig iron in the higher silicons, added to orders for the ordinary foundry grades, brought the week's sales up to a fairly respectable total. Buyers of pig iron and of raw materials and finished products in general, however, are conservative in commitments, due to labor unrest and to uncertainties regarding the outcome of the NRA program. Pig iron buyers, in most cases, are not putting out open inquiries, but are negotiating privately with sellers. Considerable Indian iron arrived the past week, and more is due currently, virtually all of which has been sold. As for the New England melt, the most important foundries are steadily doing better, while others are not faring so well.

Quietness in the scrap market has been emphasized by the Jewish holidays. Not enough material was moved to really establish prices. Despite the declining operating rate of Pennsylvania steel mills, local brokers appear confident that a buying movement of sizable proportions is impending. In view of this feeling they are not inclined to reduce prices.

Possibly the most encouraging feature of the New England situation is the laying of a foundation for a more active fabricated structural steel market, which gives every promise of early development, and a steady consumption of warehouse products as well as alloy steels.

Industrial Relations Counselors, Inc., New York, has removed offices from 165 Broadway to R. K. O. Building, 1270 Sixth Avenue.

Advances Drive in Business in Eastern Pennsylvania

Increases on Plates, Shapes and Bars Have Favorable Effect, Although Specifications Are Not Large—Heavy Melting Scrap Off 50c. a Ton

PHILADELPHIA, Sept. 26.—Increases of $2 a ton on plates and shapes and $3 a ton on merchant steel bars for the fourth quarter have stimulated contracting at the existing levels. In order to take advantage of the lower quotations it is necessary for consumers to complete contracts by Sept. 29. After that date new business will be taken under the code at 1.80c., Coatesville and Bethlehem, for plates, 1.80c., Bethlehem on shapes, and 1.75c., Pittsburgh, for steel bars. By taking delivery after Sept. 30, consumers will get advantage of cancellation of the freight surcharge and this is being done in many cases.

The Pittsburgh-Philadelphia surcharge on finished steel is 2c. per 100 lb. for carlots. With this extra charge eliminated the rate will be restored to 29c. The Bethlehem-Philadelphia rate will be reduced to 10.5c, per 100 lb. from 11.55c., and the Coatesville-Philadelphia rate will be decreased to 8.5c. per 100 lb. from 9.35c. The pig iron rate from the nearest furnace, Conshohocken, Pa., to Philadelphia will be reduced 8c. per ton, from 84c. to 76c.

It is reported, however, that the railroads contemplate increased rates on less-than-carload shipments which would be greater than existing surcharge rates.

There is still confusion over code regulations, both on the part of mills and buyers, especially the latter. Of the three methods for contracting, the one providing for percentage placement is causing the most difficulty. It is hoped, however, that after the regulations have been in existence a little longer they will be more clearly understood, or revised if that is found to be necessary. The "definite" and "minimum-maximum" methods of contracting appear to meet with general approval.

Open-hearth operations in this district remain unchanged at 35 per cent of capacity.

Pig Iron

New buying is confined to miscellaneous lots, ranging from carloads to 250 tons. Specifications and shipments continue to hold up fairly well. Prices for the fourth quarter have not been changed, despite higher costs for labor and raw materials. The furnace of the E. & G. Brooke Co., at Birdsboro, Pa., went into blast last week. It is expected that announcement soon will be made on fourth quarter prices for ferromanganese. It has not been indicated whether there will be any change.

Warehouse Business

Jobbers report a decline in demand. Prices are unchanged.

Plates, Shapes and Bars

Mills have taken fair-sized tonnages at third quarter prices. After Sept. 29 the increased prices, $2 up on shapes and plates, and $3 up on merchant steel bars, will become effective. Bookings, however, have not been heavy, and mills will enter the fourth quarter with limited schedules. They are looking for better business in that period from the public works program, which as yet has been an almost negligible factor. There is also hope that the Government will be successful in its efforts to have the railroads come into the market for large tonnages.

Sheets

Demand has fallen off to a low point, but mills continue to operate at a high rate on backlog tonnage. With new models under way, it is expected that there will be an early resumption of automotive buying.

Imports

The following iron and steel imports were received here last week: 487 tons of chrome ore from British South Africa, 250 tons of ferromanganese from Norway, and 13 tons of cold-drawn steel rods, 9 tons of steel bars and 3 tons of steel tubes from Sweden.

Scrap

The market has developed further weakness. No. 1 heavy melting steel has sold during the past week at $10.50, a decline of 50c. a ton, though the $11 quotation has not disappeared. Tonnages of heavy axle turnings has been moved at $9.50. Sales of heavy breakable cast, however, reflect greater strength in this grade, having been made at $10.50 to $11. No. 2 heavy melting steel is being purchased at $9 to $9.50. Demand is light.

Cincinnati Market Is Apathetic

CINCINNATI, Sept. 26.—Interest in fourth quarter pig iron is meager, consumers having ordered heavily prior to the adoption of code prices. In fact, the trade has adopted a watchful waiting attitude and are somewhat hesitant even to make inquiry for material. Shipments against old contracts have been sustained largely because of furnace insistence that material be ordered out in accordance with contract terms. Total bookings, the past week, were about 300 tons, all in small lots. Foundries generally are operating at a lower rate than a month ago, with a few automotive foundries accounting for the bulk of present operations.

Coke

Reflecting the easing of pig iron business, specifications for foundry coke have tapered. New business is small.

Steel

With code prices in effect, uncertainties in schedules, heretofore merely discussed, were accentuated in the face of a sharp decline in bookings. Demand from all sources was off about 25 per cent. from the preceding week, the leading interest reporting new business near 50 per cent. of capacity output. Sheets were purchased in good quantities in anticipation of price revisions so that consumers are now carrying inventories in excess of present needs. Production is steady at close to 70 per cent. of capacity in the reduction of backlogs, which at present rate will be wiped out in about two weeks.

Scrap

Reduction in mill operations is reflected in a softer scrap market. Dealers' bids on steel and rails are down 25c. to 50c. without appreciable sales.

Scrap Declines at Detroit

DETROIT, Sept. 26.—The local scrap market continues dull, with prices of most items off 25c. a ton. Steel mills, particularly at Pittsburgh and in the Valleys, are still asking dealers to hold up shipments on current contracts. The district steel plant, well stocked with scrap, is virtually out of the market at the moment.

Mare Island Navy Yard has awarded 200 tons of cold-rolled sheets to Youngstown Sheet & Tube Co.

Spurt of Buying in Heavy Rolled Products at Cleveland

Upturn Follows Announcement of Increases—Rail Steel Bars for Merchant Trade Also Advanced—Uniform Switching Charge Adopted

CLEVELAND, Sept. 26.—Announcement of advances of $2 per ton on plates and shapes and $3 a ton on bars for the fourth quarter has started a spurt of buying activity in the heavy rolled steel products which is expected to become more pronounced during the latter part of the week. However, because of the new provisions making steel contracts iron clad buyers are cautious about making definite commitments, as they wish to avoid becoming obligated to take deliveries of steel which they will not use. Many buyers, long accustomed to cancelling unspecified tonnages, are finding it difficult to adjust their buying to the new regulations.

Most buyers are choosing the third form of contract, binding the customer to take a stated percentage of his total requirements for the quarter in monthly quantities. A small buyer who does not wish to make a formal contract will be allowed to place an order for a specified tonnage for delivery any time during the quarter under the first form of contract.

Specifications against third quarter contracts for bars, plates and shapes are heavy, as contract customers have the advantage of old extras on these products. Should they cancel unfilled tonnage and make new contracts they will be charged the new extras. Hot-rolled strip also is active in specifications against expiring contracts. Sheets are quiet, following the recent heavy influx of specifications against old contracts. Little contracting has been done for the fourth quarter in sheets and strip steel, which have been advanced for that delivery.

Ingot output in Cleveland is unchanged this week at 45 per cent of capacity. The Otis Steel Co. put on one open-hearth furnace and one was taken off in Lorain.

Rail steel bars for the merchant trade have been advanced $3 a ton for the fourth quarter, this being the only change except on billet bars, plates and shapes.

Pig Iron

These has been some question as to whether low-priced pig iron covered by fourth quarter contracts could be carried over to the coming quarter under the operations of the code. However, leading producers, following past practices, have decided to allow their customers to take iron due on old contracts within a reasonable time after Oct. 1. New demand continues light. Some large consumers have not covered for the quarter but are deferring purchases until they need the iron. September shipments will show a gain over August, although some consumers are holding back on shipping orders to obtain the benefit of the elimination of the surcharge of 10c. per net ton, which will be taken off Oct. 1. Production costs will materially increase after Oct. 2 because of the increase in fuel costs due to the wage advance to miners, as coal contracts contain wage clauses.

Switching Rates

Uncertainty regarding switching rates in Cleveland under the code has been removed by the adoption of a uniform switching rate of 50c. per net ton for steel and pig iron to apply to the Cleveland switching area, this being about the average switching charge. At present there are three different charges, depending on the number of railroad lines that handle the shipment. As the actual railroad switching rates are unchanged, the shippers under the new arrangement will absorb the difference if the actual switching rate is above 50c. and will benefit if it is below that amount.

The new switching rate applies to products having a Cleveland basing point.

Sheets

Some of the mills will complete shipments against third quarter contracts this week but other will be unable to get out all their tonnage covering these specifications before Oct. 15. Some business is being taken at the new prices for the fourth quarter, but in small lots. Little if any business is coming from the larger consumers, as they have accumulated considerable surplus stocks. Several of the consuming industries, including barrel manufacturers, stove and furnace manufacturers and makers of electric signs, are operating fairly well,

Strip Steel

Mills have considerable tonnage in specifications against third quarter contracts for both hot and cold strip which will keep some of them busy for at least two weeks. The automotive industry has accumulated large stocks for manufacturing accessories, as specifications for material for these are seldom changed. A few fourth quarter contracts have been closed and there is a limited amount of spot business.

Rail Steel Bars

Rail steel bars for the merchant trade have been advanced $3 a ton, effective Oct. 2. The new prices are 1.70c., Cleveland, Chicago or Gary, 1.65c., Pittsburgh, and 1.75c., Buffalo. As reinforcing bars in both new billet and rail steel were advanced recently, no further change is expected in these. Both billet and rail steel bars for delivery in the Cleveland area now carry a 50c. switching charge.

Bars, Plates and Shapes

Municipal projects in Cleveland financed through Federal aid granted during the week will immediately go ahead and award will be made shortly for steel for an incinerator plant, the general contract for which has been closed, and extensions to the Easterly sewage disposal plant, requiring about 1600 tons of structural steel and reinforcing bars. Demand for plates in small lots has improved. Inquiry for plates for brewery tanks, which has subsided, has improved. Structural inquiry is light. For a factory building in Meadville, Pa., 200 tons of reinforcing bars will be required. Bars are quoted at 1.65c., Cleveland, and plates at 1.60c., Pittsburgh. The prices for consumers not covered by Oct. 1 will be 1.80c. for bars and 1.75c. for plates and shapes.

Scrap

A local steel plant which has taken no scrap for some time has released the blast furnace scrap due it on old contracts. A Valley district consumer this week released some steel-making scrap. There is no new demand and prices are unchanged. However, present prices are bringing out only small lots because of expectation of higher prices.

Bars, Plates and Shapes Advanced in South

BIRMINGHAM, Sept. 26.—Local furnaces approach the fourth quarter with only a comparatively small volume of new forward tonnage on their books. This is due, partly, to more caution on the part of foundries in making commitments under the code and, partly, to existing contracts, made prior to the code, which in many cases will run for some time longer. Current shipments are lagging and little interest is being shown in the market. Shipments have been pointed downward since July. The August movement fell behind July, and September's is less than August. The base price for spot and fourth quarter

iron remains at $13.50. No change has taken place in furnace operations in recent weeks, eight being active. Three are on basic and five on foundry. Republic Steel will change one of stacks, now on basic, back to foundry around Oct. 10.

Steel

New prices for fourth quarter tonnage were announced last week, in line with the general advances over the country. Bars are up $3 a ton; plates and shapes, $2. No. 10 hot-rolled sheets have been advanced $2, but No. 24 hot-rolled annealed and No. 24 galvanized were not changed. Buying is still light. Virginia Bridge & Iron Co. has booked 200 tons of structural steel for a store at Meridian, Miss., to be fabricated at Birmingham, and 100 tons for a Tennessee highway bridge, to be handled at Memphis. Vincennes Bridge Co. has been awarded about 450 tons for another Tennessee highway bridge. Eleven open-hearths are in operation, this being the number throughout the month.

Large Structural Projects Appear in St. Louis Mart

ST. LOUIS, Sept. 26.—The price of Southern pig iron, which has been quoted in the St. Louis industrial district at 38c. a ton less than delivered prices on Granite City iron, has been put on the same basis as the latter, the differential having been removed this week. The Granite City price is $17.50 per ton for No. 2 foundry, the delivered price being obtained by adding the switching charges, which range from 14c. to 83c. a ton in the St. Louis industrial district. While new business is not coming out, shipments against contracts are holding up at a good rate.

Steel

Advances have been announced of $2 a ton on structural shapes and plates and $3 a ton on bars, making the prices 1.75c. and 1.80c., f. o. b. Chicago, respectively. The prices will be effective at the opening of the fourth quarter.

Stupp Brothers Bridge & Iron Co. have been awarded two highway bridges in Mississippi and three in Missouri for a total of 579 tons of structural steel. New projects include a lock and dam at Canton, Mo., calling for 3600 tons of structural steel and 700 tons of reinforcing bars, for which bids will be opened Sept. 29, and 6000 tons for a municipal auditorium at Kansas City, Mo.

Scrap

Offerings of scrap iron are said to be light, and some dealers are closing their yards rather than sell at lower prices. Mills have bought sparingly during September, but they are expected to enter the market early in October. Railroad lists: St. Louis-San Francisco, 160 carloads; Missouri Pacific, 70 carloads.

Fabricated Structural Steel

Awards Gain—New Projects in Good Volume

ALTHOUGH structural steel lettings were mostly in small tonnages, the total for the past week, at 10,100 tons, was the largest since the first week in August when 28,000 tons was awarded for transmission towers from Los Angeles to Boulder Dam. An extension to the mill of the Youngstown Sheet & Tube Co. at Indiana Harbor accounts for 1000 tons, and 1200 tons is required for gates at Madden Dam, Canal Zone. New projects of 29,350 tons compare with 14,500 tons last week and 24,560 tons two weeks ago. Most of the new jobs reported are on the Pacific Coast, and include 3000 tons for a machine shop at the Puget Sound Navy Yard and about 5000 tons for Kenneth Dam in California. A referendum on the latter project is to be taken in November. Structural steel lettings for the week follow:

NORTH ATLANTIC STATES

Hasbrouck Heights, N. J., 300 tons, bridge, to American Bridge Co.

State of New York, 300 tons, bridge at Gowanda, to Lackawanna Steel Construction Corpn.

Brooklyn, 300 tons, F. & M. Schaefer Brewery, to George A. Just Co.

North Falls, N. Y., 105 tons, pipe supports, to Austin Brothers Bridge Co.

Chautauqua County, N. Y., 310 tons, State bridge, to R. S. McManus Steel Construction Co.

Lewis County, N. Y., 140 tons, State bridge, to Lackawanna Steel Construction Corpn.

Rensselaer and Washington Counties, N. Y., 420 tons, State bridges, to American Bridge Co.

Barker's Landing, Del., 210 tons, bridge, to Virginia Bridge & Iron Co., Inc.

Pittsburgh, 260 tons, bridge for Pittsburgh & West Virginia Railroad, to McClintic-Marshall Corpn.

SOUTH AND SOUTHWEST

State of Tennessee, 550 tons, highway bridges; 450 tons, bridge over French Broad River, to Vincennes Bridge Co., 100 tons, bridge over Obion River, to Virginia Bridge & Iron Co.

Gore, W. Va., 210 tons, highway bridge, to Wheeling Structural Steel Co.

St. Marys, W. Va., 350 tons, bridge, to Guibert Steel Co.

Dickson, W. Va., 120 tons, bridge, to Pan-American Bridge Co.

Meridian, Miss., 200 tons, S. H. Kress store, to Virginia Bridge & Iron Co.

Minter City, Miss., 160 tons, highway bridge, to Stupp Brothers, Bridge & Iron Co.

State of Oklahoma, 275 tons, bridges, to Kansas City Structural Steel Co.

State of Oklahoma, 150 tons, bridge to Capitol Steel & Iron Co.

State of Oklahoma, 400 tons, bridge to J. B. Klein Iron & Foundry Co.

CENTRAL STATES

Indiana Harbor, Ind., 1000 tons, extension to mills of Youngstown Sheet & Tube Co. to an unnamed bidder.

Albia, Iowa, 150 tons, bridge, to Illinois Steel Bridge Co., Jacksonville, Ill.

Liberty, Mo., 100 tons, highway bridge, to St. Joseph Structural Steel Co.

Richardson County, Neb., 100 tons, bridge work, to St. Joseph Structural Steel Co.

WESTERN STATES

Kit Carson County, Colo., 134 tons, State highway project, to an unnamed bidder.

Clark County, Utah, 322 tons, Bureau of Public Roads bridge, to an unnamed bidder.

State of Idaho, 325 tons, United States Forest Service bridge, to Pittsburgh-Des Moines Steel Co.

Mendocino County, Cal., 125 tons, State highway bridge over Feliz Creek, to Judson-Pacific Co.

San Francisco, 260 tons, trestle on Trans-Bay bridge, to Moore Dry Dock Co.

San Francisco, 250 tons, United States Forest Service bridges; 150 tons to Moore Dry Dock Co., 100 tons to Judson-Pacific Co. and McClintic-Marshall Corpn.

San Francisco, 120 tons, Rainier Brewery Co. building, to McClintic-Marshall Corpn.

Los Angeles, 150 tons additional, widening viaduct at Ionia Avenue, to Columbia Steel Co.

Los Angeles, 250 tons, factory, to McClintic-Marshall Corpn.

San Marino, Cal., 110 tons, library addition, to Pacific Iron & Steel Co.

Callam County, Wash., 485 tons, State highway bridge, to Pacific Car & Foundry Co.

Skagit County, Wash., 108 tons, two State highway bridges, to an unnamed bidder.

Baker County, Ore., 150 tons, State highway bridge over Burnt River, to an unnamed bidder.

CANAL ZONE

Panama, 1200 tons, gates for Madden dam, to Virginia Bridge & Iron Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

State of Maine, 340 tons, bridges at Phillips, Gardiner and Biddeford.

Landuff, N. H., 210 tons, highway bridge.

New York, 320 tons, building for Swift & Co.

Rockaway Park, N. Y., 150 tons, alterations to theater.

Little Falls, N. Y., 150 tons, highway bridge. Bids taken Sept. 26.

Washington, 2700 tons, Civilian Conservation Corps, camp buildings in various places.

SOUTH AND SOUTHWEST

Knoxville, Tenn., 900 tons, building.

Okeechobee, Fla., 1075 tons, hurricane gates, United States Engineer's Office.

State of Oklahoma, 800 tons, highway bridges.

CENTRAL STATES

Cleveland, 200 tons, foot bridge.

Minneapolis, 600 tons, Fleishman Malting Co. addition.

Cicero, Ill., tonnage being estimated, linen plant.

State of Iowa, 850 tons, highway bridges.

New London, Wis., 350 tons, grade separation; Wisconsin Bridge & Iron Co., Milwaukee, low bidder.

Independence, Wis., 150 tons, 140-ft. steel truss span and 100 tons of steel pjling; bids close Oct. 5.

Canton, Mo., 3600 tons, lock and dam, bids

to be opened Sept. 29 by United States Engineer's Office at Rock Island, Ill.

State of Missouri, 1000 tons, bridges.

Kansas City, Mo., 6000 tons, municipal auditorium; Alonzo Gentry, Kansas City, architect.

WESTERN STATES

State of Colorado, 300 tons, highway bridges.

State of Montana, 300 tons, highway bridges.

Custer County, Mont., 367 tons, State highway bridge over Powder River; bids Sept. 28.

Boulder Dam, 3100 tons, trash racks.

Kern County, Cal., 161 tons, State overcrossing at Oil Junction; bids Oct. 11.

Pasadena, Cal., 428 tons, three spillway gates at Pine Canyon dam; McClintic-Marshall Corpn. low bidder.

Seattle, 400 tons, six bridges for Alaska Road Commission; Columbia Steel Co. low bidder.

Puget Sound, Wash., 3000 tons, machinery shop at Navy Yard; bids Oct. 9.

Oakland, Cal., 2000 tons, Hall of Records building, plans completed.

San Francisco, 360 tons, inspection bridge on Trans-Bay bridge; bids soon.

McConnel, Cal., 100 tons, subway for Southern Pacific Railroad.

San Francisco, 1600 tons, Newark transmission line; vote on bonds in November.

State of California, 5000 tons, Kenneth dam transmission line; referendum in November.

FABRICATED PLATE

AWARDS

Huntington, W. Va., 262 tons, tanks for Fesenmeier Beverage Co., to Littlefield Bros. Inc., Cincinnati.

Cohoes, N. Y., 242 tons, tanks for Sinclair Refining Co., to Wheeling Structural Steel Co.

Omaha, Neb., 3186 tons, gas holder, to Stacey Mfg. Co.

Oleum, Cal., 600 tons, tanks for Union Oil Co., to Consolidated Steel Co.

NEW PROJECTS

Evanston, Ill., tonnage being estimated, elevated water tank.

Chicago, 1100 tons of plates for shipbuilders in Chicago territory.

Cast Iron Pipe

Providence, R. I., has awarded a round tonnage of special castings to Warren Foundry & Pipe Co.

Van Buren, Me., plans pipe line extensions for water system to cost about $15,000.

Evanston, Ill., plans additions to its water system.

Oakland, Iowa, asks bids until Oct. 9 for 3500 ft. of 6-in. and 2000 ft. of 4-in. for water system. Kenneth Young, Baum Building, Omaha, Neb., is consulting engineer.

Columbia, S. C., plans pipe line extensions in water system. Fund of $812,423 is being arranged for this and sewage system.

Lincoln, Neb., is considering extensions in water pipe lines. Cost about $200,000. Financing will soon be arranged. D. L. Erickson is city engineer.

Elgin, Ill., plans about 10,000 ft. or 12-in. and 7000 ft. of 8-in. for extensions in water supply system. Cost about $79,000. Financing has been authorized. V. H. Kasser is city engineer.

San Clemente, Cal., plans about 46,750 ft. of 4-in. for extensions in water system. Cost about $35,000. W. A. Ayer is city engineer.

Monmouth Consolidated Water Co., Long Branch, N. J., plans 12-in. trunk line from Middletown to Matawan, N. J., and vicinity, about five miles.

Redwood City, Cal., has completed plans for 120 tons of 8-in.

El Centro, Cal., has completed plans for 700 tons of 18-in.

Bremerton, Wash., will take bids Sept. 30 for 100 tons of 6 to 12-in.

Puget Sound Navy Yard, Wash., will close bids Oct. 4 for 350 tons.

OBITUARY

JOHN S. BARNES, president of the W. F. & John Barnes Co., Rockford, Ill., died suddenly at his home on Sept. 19, aged 52 years. He was the son of the late John Barnes, whose venture into the machine tool business in 1868 was one of the first enterprises of its type in the country. Mr. Barnes was graduated from Rockford High School and then attended Princeton University, from which he was graduated in 1905 with a civil engineering degree. After his graduation he entered his father's business. In 1907 he was made superintendent of the company and for 17 years worked with the men on the floor. In 1924 he was made president and general manager of the company, which position he held at the time of his death. The machine tool industry has lost one of its most prominent men in his passing.

JOHN S. BARNES

John Barnes at the time of his death was a director of the Burd Piston Ring Co. and the Mattison Machine Co. of Rockford; president of the Board of Trustees of Rockford College. He was also a member of a number of clubs and of the National Association of Manufacturers.

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IRWIN C. SUTPHEN, who had been manager of the New York office of Armco International for the last 15 years, died on Sept. 19 after an illness of two weeks. Mr. Sutphen was on a vacation in Middletown, Ohio, and was preparing to return East. He became a member of the Armco organization upon graduation from school. Before receiving the appointment to New York, he represented the Rolling Mill company in Cuba.

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MYLES B. LAMBERT, formerly transportation sales manager for Westinghouse Electric & Mfg. Co., died this week at his Long Island home. He joined the Westinghouse company in 1900, retiring only a few months ago because of illness. He was 60 years old.

Reinforcing Steel

Awards 2300 Tons—New Projects 6700 Tons

Belknap and Dublin Counties, N. H., 320 tons, road mesh, to American Steel & Wire Co.

Chicago, 100 tons, Armstrong Varnish Co., to Concrete Steel Co.

Chicago, 170 tons, superstructure for Mannheim viaduct, to Concrete Steel Co.

State of Indiana, 900 tons, road work, to various bidders.

San Francisco, 120 tons, Irish-American hall, to W. S. Wetenhall Co.

State of California, 239 tons, highway work in 16 counties, to various bidders.

San Marino, Cal., 100 tons, library addition, to Blue Diamond Corpn.

Altadena, Cal., 250 tons, mausoleum, to Soule Steel Co.

Steilacoom, Wash., 100 tons, ward building at State Hospital, to Northwest Steel Rolling Mill Co.

NEW REINFORCING BAR PROJECTS

State of New York, 500 tons, road mesh; awards to be made by contractors during week.

New Orleans, 4100 tons, Bonnett Carie spillway bridge; bids discarded and work to be readvertised.

Meadville, Pa., 200 tons, building for Hookless Fastener Co.

Cairo, Ill., 800 tons, highway bridge.

State of Indiana, tonnage being estimated, highway bridges on which bids will be opened Oct. 5.

Canton, Mo., 700 tons, lock and dam, bids to be opened Sept. 29 by United States Engineer's Office at Rock Island, Ill.

State of Montana, 178 tons, highway construction in five counties; bids Sept. 28.

Kern County, Cal., 119 tons, State overhead crossing at Oil Junction; bids Oct. 11.

State of Oregon, 113 tons, highway construction in four counties; bids Oct. 5.

Pipe Lines

Salton Sea Chemical Co., Brawley, Cal., plans steel pipe line from gas fields at Niland, Cal., to new plant at Brawley, now in course of erection, about 15 miles.

Board of District Commissioners, District Building, Washington, asks bids until Oct. 3 for steel pipe bends for water supply line.

Miller & McCloskey, Alma, Mich., plan welded steel pipe line from natural gas fields near Mount Pleasant, Mich., to Alma, St. Louis, Clare, Shepherd and other neighboring municipalities, about 45 miles, using 6⅝-in. pipe. Project will include distribution lines at different communities. Financing is being arranged.

Northern Natural Gas Co., Rochester, Minn., has secured 15-year franchise for commercial natural gas service at Faribault, Minn., and plans pipe lines for main supply and distribution.

Wauchula, Fla., plans steel pipe line system in connection with new municipal artificial gas plant. Cost about $56,000. Financing is being arranged.

Gearhart, Ore. plans about 7900 ft. of steel pipe for trunk line service for new water supply. Financing is being arranged. A. F. Danielson, Astoria, Ore., is engineer.

Quotations on Non-Ferrous Metals Hold Firmly Despite Light Consumer Demand

Prime Western Producers Restrict Offerings at 4.75c. a lb.—Lead Bookings Ease Off—Copper Buying Is Light—Tin Inactive

NEW YORK, Sept. 26.—A moderate revival in consumer interest in electrolytic copper was indicated during the past week, and scattered sales were made at 9c. a lb., Connecticut Valley. Producers are holding offerings steady at the 9c.-level, and pressure from resale metal at shaded levels is lacking. Bookings are for prompt metal and positions through January, but no encouragement is being given buyers attempting to cover late first quarter requirements. Deliveries continue in fair volume, and the September total is expected to approach the excellent volume of August. Custom smelters have been unable to settle their difficulties with producers, and a revised code has not been presented. Nevertheless, the market position continues to be strengthened by the probability of higher prices due to increased conversion costs which will result from known code provisions. The increased activity of inflationists has also made sellers of all metals less anxious to make extended forward bookings.

Tin

During the week quotations were steadier than in previous periods, but domestic consumers were apparently uninterested in securing additional supplies. Buying activity was limited to negligible movements of spot Straits and English refined. Sterling fluctuations often accounted for a 20-point shift in tin quotations, which were not of the magnitude of previous erratic changes, but sufficient to discourage potential buyers. Prices dropped from 47.87½c. a lb. to 47.20c. on sterling changes during the week, and metal was available in New York late this afternoon at the latter figure. Business in London is extremely restricted. English exporters report accelerated deliveries to American buyers, despite the heavy stocks listed in New York warehouses. Limited transactions were made today in London on a first call listing of £215 10s. for spot standard, £215 7s. 6d. for future standard and £222 5s. for spot Straits. Prices in the Far East rose to £221 12s. 6d. Shipments to America totaled 286 tons, and United Kingdom stocks declined to 14,894 tons.

Zinc

Spelter is being held steady at 4.75c. a lb., East St. Louis, despite scattered efforts by consumers to encourage shading. Fresh buying is confined to light tonnages of prompt metal, although Prime Western is nominally available at the current quotation for positions throughout the year. Sellers are avoiding forward bookings since a strengthening of price is expected upon the reappearance of the market demand which has been accumulating during the past two months. Joplin concentrates were available throughout the week at $31 a ton, and sales totaled 4700 tons. Output increased 600 tons to 6600 tons despite the endeavors of Tri-State miners to agree upon output restriction. Shipments totaled 6050 tons, and stocks increased 500 tons to 8300 tons. Unless the mines devise a control plan the position of ore may be weakened, as several properties, heretofore idle, will begin to produce within the next three weeks.

Lead

Consumer demand eased off Monday, after heavy buying during the previous two weeks. All users, with the exception of cable manufacturers, made moderately heavy commitments, and estimated October requirements are fairly well covered. Prices are firm, but the brisk demand strengthened the market only slightly because of sympathetic negative pressure from London. Shipments continue in good volume, and producers expect a further moderate stock decrease in September. The August statistical improvement was greater than operators had anticipated, as visible domestic stocks dropped 10,800 tons to 160,500 tons. The current position is at the lowest point since December, 1931. The reduction resulted from shipments of 35,800 tons, whereas output was held at 25,000 tons. Secondary sources supplied more metal to the trade, but their output was insufficient to press heavily on the market.

The International Harvester Co. is making arrangements to build its half-ton trucks at its Springfield, Ohio, plant instead of at the Willys-Overland factory in Toledo. Some parts will be manufactured at the company's Fort Wayne, Ind., plant, but all assemblies will be made at Springfield. Production will be continued at Toledo until expanded facilities at Springfield are ready.

The Week's Prices. Cents Per Pound for Early Delivery

	Sept. 20	Sept. 21	Sept. 22	Sept. 23	Sept. 25	Sept. 26
Electrolytic copper, N. Y.*	8.75	8.75	8.75	8.75	8.75	8.75
Lake copper, New York	9.00	9.00	9.00	9.00	9.00	9.00
Straits tin, Spot, N. Y.	47.87½	47.60	47.60	....	47.35	47.20
Zinc, East St. Louis	4.75	4.75	4.75	4.75	4.75	4.75
Zinc, New York	5.12	5.12	5.12	5.12	5.12	5.12
Lead, St. Louis	4.35	4.35	4.35	4.35	4.35	4.35
Lead, New York	4.50	4.50	4.50	4.50	4.50	4.50

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 7.00c. a lb., New York.
Brass ingots, 85-5-5-5, 9c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	49.25c. to 50.25c.
Tin, bar	51.25c. to 52.25c.
Copper, Lake	10.50c. to 11.25c.
Copper, electrolytic	10.25c. to 10.75c.
Copper, castings	10.00c. to 11.00c.
*Copper sheets, hot-rolled	17.12½c.
*High brass sheets	14.75c.
*Seamless brass tubes	16.37½c.
*Seamless copper tubes	16.62½c.
*Brass rods	12.25c.
Zinc, slabs	6.00c. to 7.00c.
Zinc sheets (No. 9), casks	9.75c. to 10.00c.
Lead, American pig	5.50c. to 6.50c.
Lead, bar	7.00c. to 8.00c.
Lead, sheets	8.25c.
Antimony, Asiatic	8.50c. to 9.50c.
Alum., virgin, 99 per cent plus	23.30c.
Alum. No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	30.00c. to 31.00c.
Babbitt metal commercial grade	25.00c. to 50.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	50.25c.
Tin, bar	52.25c.
Copper, Lake	10.25c.
Copper, electrolytic	10.25c.
Copper, casting	10.00c.
Zinc, slab	6.00c. to 6.25c.
Lead, American pig	5.35½c. to 5.50c.
Lead, bar	8.50c.
Antimony, Asiatic	9.00c.
Babbitt metal, medium grade	19.00c.
Babbitt metal, high grade	55.25c.
Solder, ½ and ½	28.75c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	7.00c.	8.00c.
Copper, hvy. and wire	6.75c.	7.75c.
Copper, light and bottoms	5.75c.	6.25c.
Brass, heavy	3.75c.	4.50c.
Brass, light	3.50c.	3.75c.
Hvy. machine composition	5.25c.	6.00c.
No. 1 yel. brass turnings	5.00c.	5.625c.
No. 1 red brass or compos. turnings	5.00c.	5.50c.
Lead, heavy	3.50c.	3.875c.
Zinc	2.75c.	3.00c.
Cast aluminum	7.50c.	8.75c.
Sheet aluminum	11.50c.	13.00c.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

Base per Lb.

F.o.b. Pittsburgh mill.....1.60c. to 1.75c.
F.o.b. Chicago or Gary ....1.65c. to 1.80c.
Del'd Philadelphia .....1.91c. to 2.04c.
Del'd New York .....1.95c. to 2.08c.
F.o.b. Cleveland .....1.65c. to 1.80c.
F.o.b. Buffalo .....1.70c. to 1.85c.
F.o.b. Birmingham .....1.75c. to 1.90c.
F.o.b. cars dock Pacific ports .....2.15c. to 2.30c.

Rail Steel
(For merchant trade)

F.o.b. Cleveland .....1.55c. to 1.70c.
F.o.b. Chicago .....1.55c. to 1.70c.
F.o.b. Gary .....1.55c. to 1.70c.
F.o.b. Pittsburgh .....1.50c. to 1.65c.
F.o.b. Buffalo .....1.60c. to 1.75c.

Billet Steel Reinforcing

(Stock lengths as quoted by distributers; cutting to length, 60 in. and over takes extra of 10c. per 100 lb.)

F.o.b. P'gh mills .....1.80c.
F.o.b. Birmingham .....1.85c.
F.o.b. Buffalo .....1.85c.
F.o.b. Cleveland .....1.85c.
F.o.b. Youngstown .....1.85c.
F.o.b. Chicago or Gary .....1.85c.
F.o.b. cars dock Pacific ports.....2.35c.

Rail Steel Reinforcing

(Cut lengths as quoted by distributers)

F.o.b. Pittsburgh .....1.75c.
F.o.b. Cleveland .....1.80c.
F.o.b. Chicago .....1.80c.

Iron

Common iron, f.o.b. Chicago.1.60c. to 1.75c.
Refined iron, f.o.b. P'gh mills.....2.75c.
Common iron, del'd Philadelphia .....1.74c. to 1.76c.
Common iron del'd New York.....1.90c.

Steel Car Axles

F.o.b. Pittsburgh .....2.50c.
F.o.b. Chicago .....2.50c.

Tank Plates

Base per Lb.

F.o.b. Pittsburgh mill ....1.60c. to 1.70c.
F.o.b. Chicago .....1.65c. to 1.75c.
F.o.b. Gary .....1.65c. to 1.75c.
F.o.b. Birmingham .....1.75c. to 1.85c.
Del'd Cleveland .....1.8035c. to 1.985c.
Del'd Philadelphia ....1.7935c. to 1.885c.
F.o.b. Coatesville .....1.70c. to 1.80c.
F.o.b. Sparrows Point .....1.70c. to 1.80c.
Del'd New York .....1.898c. to 1.98c.
F.o.b. dock cars Pacific ports .....2.15c. to 2.25c.
Wrought iron plates, f.o.b. P'gh....3.00c.

Floor Plates

F.o.b. Pittsburgh .....3.10c. to 3.20c.
F.o.b. Chicago .....3.15c. to 3.25c.

Structural Shapes

Base per Lb.

F.o.b. Pittsburgh mill.....1.60c. to 1.7?c.
F.o.b. Chicago .....1.65c. to 1.75c.
F.o.b. Birmingham .....1.75c. to 1.85c.
F.o.b. Buffalo .....1.70c. to 1.80c.
F.o.b. Bethlehem .....1.70c. to 1.80c.
Del'd Cleveland .....1.8035c. to 1.885c.
Del'd Philadelphia .....1.8155c. to 1.905c.
Del'd New York .....1.86775c. to 1.9525c.
F.o.b. dock cars Pacific ports (standard) .....2.15c. to 2.25c.
F.o.b. dock cars Pacific ports (wide flange) .....2.25c. to 2.35c.

Steel Sheet Piling

Base per Lb.

F.o.b. Pittsburgh .....1.90c.
F.o.b. Chicago mill .....2.00c.
F.o.b. Buffalo .....2.00c.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade, base..2.45c. a lb. except at Bethlehem where the price is 2.55c.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
2000 (½ % Nickel)	$0.25
2100 (2½ % Nickel)	0.55
2300 (3½ % Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum).(1.50 to 2.00 Nickel	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Cold Finished Bars*

Bars, f.o.b. Pittsburgh mill .....1.95c.
Bars, f.o.b. Chicago .....2c.
Bars, Cleveland .....2c.
Bars, Buffalo .....2c.
Bars, Detroit .....2.15c.
Bars, eastern Michigan .....2.20c.
Shafting, ground, f.o.b. mill,
1⅛ in. 3.25c.
1-3/16 to 1½ in. 2.75c.
1-9/16 to 1⅞ in. 2.60c.
1-15/16 to 2⅞ in. 2.45c.
2-15/16 to 6 in. 2.30c.

* In quantities of 10,000 to 19,999 lb.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

No. 10, f.o.b. Pittsburgh .....1.75c.
No. 10, f.o.b. Gary .....1.85c.
No. 10, del'd Phila. .....2.04c. to 2.06c.
No. 10, f.o.b. Birmingham .....1.90c.
No. 10, f.o.b. dock cars Pacific ports .....2.42½c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh .....2.25c.
No. 24, f.o.b. Gary .....2.35c.
No. 24, del'd Phila. .....2.54c. to 2.56c.
No. 24, f.o.b. Birmingham .....2.40c.
No. 24, f.o.b. dock cars Pacific ports .....2.95c.
No. 24, wrought iron, Pittsburgh...4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh.....2.30c.
No. 10 gage, f.o.b. Gary .....2.40c.
No. 10 gage, del'd Phila...2.59c. to 2.61c.
No. 10 gage, f.o.b. dock cars Pacific ports .....3.00c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh ....2.75c.
No. 20 gage, f.o.b. Gary .....2.85c.
No. 20 gage, del'd Phila. .3.04c. to 3.06c.
No. 20 gage, f.o.b. dock cars Pacific ports .....4.45c.

Galvanized Sheets

No. 24, f.o.b. Pittsburgh .....2.85c.
No. 24, f.o.b. Gary .....2.95c.
No. 24, del'd Phila. .....3.14c. to 3.16c.
No. 24, f.o.b. Birmingham .....3.00c.
No. 24, f.o.b. dock cars Pacific ports .....3.55c.
No. 24, wrought iron, Pittsburgh ..4.95c.

Long Terne

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh .....2.90c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh .....2.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh .....2.50c.
No. 28, Gary .....2.60c.

Tin Plate

Base per Box

Standard cokes, f.o.b. P'gh district mill $4.65
Standard cokes, f.o.b. Gary 4.75

Terne Plate

(F.o.b. Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C. $8.70
15-lb. coating I.C. 11.00
20-lb. coating I.C. 11.90
25-lb. coating I.C. 13.00
30-lb. coating I.C. 13.80
40-lb. coating I.C. 15.30

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

Base per Lb.

All widths up to 24 in., P'gh. .....1.75c.
All widths up to 24 in., Chicago .....1.85c.
Cooperage stock, Pittsburgh .....1.85c.
Cooperage stock, Chicago .....1.95c.

Cold-Rolled Strips

F.o.b. Pittsburgh .....2.40c.
F.o.b. Cleveland .....2.40c.
Del'd Chicago .....2.70c.
F.o.b. Worcester .....2.60c.

Fender Stock

No. 20. Pittsburgh or Cleveland ....3.10c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade

Per Lb.

Bright wire .....2.10c.
Spring wire .....3.10c.

To Jobbing Trade

Extras of 10c. a 100 lb. on joint carloads and 30c. on pooled cars and less-than-carload lots are applied on all merchant wire products. An allowance of $2 a ton is made to jobbers on straight, mixed or joint carloads; $3 a ton is allowed on less-than-carload shipments.

Base per Keg

Standard wire nails $2.10
Smooth coated nails 2.10
Galvanized nails 3.60

Base per 100 Lb.

Smooth annealed wire $2.25
Smooth galvanized wire 2.60
Polished staples 2.80
Galvanized staples 3.05
Barbed wire, galvanized 2.60
Woven wire fence, base column ... 55.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio Mills

Butt Weld

Steel Inches	Steel Black	Steel Galv.	Wrought Iron Inches	Wrought Iron Black	Wrought Iron Galv.
⅛	.....	51½	29½	⅛	..+91½	+138
¼ to ⅜	..	57	38½	¼ & ⅜	+1½	+21½
½	.....	62	50½	½	....	31½	15
¾	.....	65½	55½	¾	....	36½	20½
1 to 3	...	67½	58½	1&1¼	.	39½	25½
				1½	...	43½	28
				2	.....	41½	26

Lap Weld

2	.....	63½	54½	2	.....	37	22½
2½ to 3	..	66½	57½	2½ to 3½	38	25
3½ to 6	..	68½	59½	4 to 8	..	40	28½
7 and 8	...	67½	57½	9 to 12	..	38	24½
9 and 10	..	67	57				
11 and 12		66	56				

Butt Weld, extra strong, plain ends

¼	.....	48½	33½	¼	...+13	+45½
⅜ to ¾	..	54½	41½	⅜ & ¾	+2½	+34½
½	.....	60	51	½	.....	32½	17½
¾	.....	64½	55½	¾	.....	37½	22½
1 to 3	..	66½	58½	1 to 2	..	43½	29

Lap Weld, extra strong, plain ends

2	.....	61½	53½	2	.....	40	26
2½ to 3	..	65½	57½	2½ to 4	45½	33
3½ to 6	..	69	61	4½ to 6	45	32½
7 and 8	..	68	58	7 & 8	..	46	33
9 and 10	..	67	57	9 to 12	.	41½	30
11 and 12	.	66	56				

Discounts on steel and wrought iron pipe are net and not subject to any points or preferentials.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	33	1½ in.	1
2½ in.—2¾ in.	40	1¾ in.	8
3 in.	47	2 in.—2¼ in.	13
3¼ in.—4½ in.	50	2½ in.—2¾ in.	16
4 in.	52	3 in.	17
4½ in. to 6 in.	42	3½ in. to 3½ in	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold-Drawn

1 in.	61	3 in.	41
1¼ to 1½ in.	53	3¼ to 3½ in.	44
1¾ in.	37	4 in.	46
2 to 2¼ in.	27	4½ . 5 and 6 in	36
2½ to 2¾ in.	34		

Hot-Rolled

2 and 2¼ in.	33	3¼ to 3½ in.	50
2½ and 2¾ in.	40	4 in.	52
3 in.	47	4½. 5 and 6 in.	42

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb. base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb.. base discounts are reduced 6 points with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. in lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Per Cent Off List

Carbon, 0.10% to 0.30% base (carloads) 5
Carbon, 0.30% to 40% base 5
Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, 60-lb. and heavier, per gross ton $40.00
Angle bars, per 100 lb. 2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton $32.00
Light rails (from rail steel) per gross ton $1.50

Base per 100 Lb.

Spikes, 9/16 in. and larger $2.60
Spikes, ½ in. and smaller 2.60
Spikes, boat and barge 2.60
Tie plates, steel 1.50
Track bolts, to steam railroads 2.60
Track bolts, to jobbers, all sizes (per 100 count) .....73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine bolts .....
Carriage bolts .....
Lag bolts .....
Plow bolts, Nos. 1, 2, 3 and 7 heads..
Hot-pressed nuts, blank or tapped, square .....
Hot-pressed nuts, blank or tapped, hexagons .....
C.p.c. and t. square or hex nuts, blank or tapped .....
Semi-finished hexagon nuts .....
Semi-finished hexagon castellated nuts, S.A.E. .....
Stove bolts in packages, P'gh. 72½. 25 and
Stove bolts in packages, Ch'go. 72½, 25 and
Stove bolts in packages, Cleveland. 72½, 25 and
Stove bolts in bulk, P'gh. .....
Stove bolts in bulk, Chicago .....
Stove bolts in bulk, Cleveland .....
Tire bolts .....

Large Rivets

(½-in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh or Cleveland .... $2.
F.o.b. Chicago ..... 2.

Small Rivets

(7/16-in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh .....70, 10 and
F.o.b. Cleveland .....70, 10 and
F.o.b. Chi'o and Birm'g'm...70, 10 and

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

Per Cent Off List

Milled cap screw, 1 in. dia. and smaller .....
Milled standard set screws, case hardened, 1 in. dia. and smaller .....
Milled headless set screws, cut thread ⅜ in. and smaller .....75 and
Upset hex. head cap screws, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller .....85 and
Upset set screws, sq. head .....
Milled studs .....

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Youngstown, Chicago, Gary, Buffalo, Cleveland, Birmingham.

Per Gross Ton

Rerolling $26.00
Forging quality 31.00

Sheet Bars

F.o.b. Pittsburgh, Youngstown, Cleveland, Chicago, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Open-hearth or Bessemer $26.00

Skelp

F.o.b. Pittsburgh, Youngstown, Chicago, Buffalo, Coatesville, Pa., or Sparrows Point, Md.

Per Lb.

Grooved .....1.60c.
Universal .....1.60c.
Sheared .....1.60c.

Pig Iron, Ores, Ferroalloys

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$35.00
Cleveland	35.00
Chicago	36.00
Birmingham	38.00
Youngstown (del'd)	36.00

ALLOY STEEL BLOOMS, BILLETS AND SLABS

F.o.b. Pittsburgh, Chicago, Buffalo, Massillon, Canton or Bethlehem. Base price, $49 a gross ton except at Bethlehem, where it is $51.

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville Prompt	$2.50 to $2.75
Foundry, f.o.b. Connellsville Prompt	3.25 to 4.50
Foundry, by-product, Chicago ovens, for delivery outside switching districts	8.00
Foundry, by-product, delivered in Chicago switching district	8.75
Foundry, by-product, New England, delivered	10.50
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	8.50
Foundry, by-product, Cleveland, delivered	8.76
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal (Nominal)

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.50 to $2.00
Mine run coking coal f.o.b. W. Pa.	1.75 to 2.25
Gas coal, ¾-in., f.o.b. Pa. mines	2.00 to 2.50
Mine run gas coal, f.o.b. Pa. mines	2.00 to 2.25
Steam slack, f.o.b. W. Pa. mines	85c. to 1.00
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.25

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.

No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. f.o.b. Baltimore

No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. del'd Chicago

No. 3 industrial fuel oil	3.73c.
No. 5 industrial fuel oil	3.23c.

Per Gal. f.o.b. Cleveland

No. 3 distillate	5.50c.
No. 4 industrial	5.00c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works: High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	55.00	43.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Chrome Brick

	Per Net Ton
Standard size	$45.00

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago	54.00
Birmingham	55.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, burned, f.o.b. Baltimore and Chester, Pa.	$65.00
Unburned, f.o.b. Baltimore	52.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

CAST IRON PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$43.40 to $44.40
4-in., del'd Chicago	46.40 to 47.40
4-in., and larger, del'd New York	38.30
4-in., del'd New York	41.30
4-in., and larger, Birmingham,	$35.00 to 36.00
4-in., Birmingham	38.00 to 39.00

Class "A" and gas pipe, $3 extra.

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$18.00	$18.50	$17.50	$19.00
Bethlehem, Pa.	17.50	18.00	17.00	18.50
Birdsboro, Pa.	17.50	18.00	17.00	18.50
Swedeland, Pa.	17.50	18.00	17.00	18.50
Sparrows Point, Md.	17.50	18.00	17.00	18.50
Neville Island, Pa.	18.00	18.00	17.50	18.50
Sharpsville, Pa.	17.50	17.50	17.00	18.00
Youngstown	17.50	17.50	17.00	18.00
Buffalo	17.50	18.00	16.50	18.50
Erie, Pa.	17.50	18.00	17.00	18.50
Cleveland	17.50	17.50	17.00	18.00
Toledo, Ohio	17.50	17.50	17.00	18.00
Detroit	17.50	17.50	17.00	18.00
Hamilton, Ohio	17.50	17.50	17.00	18.00
Chicago	17.50	17.50	17.00	18.00
Granite City, Ill.	17.50	18.00	17.00	....
Duluth, Minn.	18.00	18.00	....	18.50
Birmingham	13.50	....	12.50	....
Provo, Utah	16.50	....	....	....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston and nearby New England				
From Everett, Mass.	$19.00	$19.50	$18.50	$20.00
From Buffalo	19.00	19.50	18.50	20.00
Brooklyn				
From East. Pa. or Buffalo	19.90	20.40	19.40	20.90
Eastern New Jersey				
From East. Pa. or Buffalo	19.02	19.52	18.52	20.02
Philadelphia				
From Eastern Pa.	18.34	18.84	17.84	19.34
Cincinnati				
From Hamilton, Ohio	18.61	18.61	18.11	19.11

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.	$22.00
Johnson City, Tenn.	22.00
F.o.b. Valley furnace	22.00
Del'd Chicago	27.65

GRAY FORGE PIG IRON

Valley furnace	$17.50

CHARCOAL PIG IRON

Lake Superior furnace	$20.50
Delivered Chicago	23.67
Delivered Buffalo	23.91

CANADA

Pig Iron

Per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	21.00
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$22.50
No. 2 fdy., sil. 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard, (carloads)	$82.00
Domestic, 80%, seaboard, (less carloads)	89.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$27.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$74.50
50% (less carloads)	82.00
75% (carloads)	120.00
75% (less carloads)	130.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads)	31.00
14% to 16% (less carloads)	36.00

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$22.25	12%	$29.25
7%	23.25	13%	30.75
8%	24.25	14%	32.25
9%	25.25	15%	33.75
10%	26.25	16%	35.25
11%	27.75	17%	36.75

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$27.25	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 1½ to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads	94c.
Ferrotungsten, less carloads	$1.00
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	9.50c.
Ferrochromium, 2% carbon	16.50c. to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c
Ferrovanadium, del., per lb. contained Va	$2.60 to 2.80
Ferrocarbontitanium, 15 to 18% per net ton, f.o.b. furnace in carloads	160.00
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage	50.00
Ferrophosphorous, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	$36.00
Ton lots or less, per ton	41.00
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	85.00
2% carbon grade	90.00
1% carbon grade	100.00
Spot prices	$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range, Bessemer, 51.5% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorous, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	8c.
Iron, low phos., Swedish, average 64½% iron	8.50c.
Iron, basic or foundry, Swedish, average, 65% iron	8c.
Iron, basic or foundry, Russian, aver. 65% iron (nom.)	8c.
Manganese, Caucasian, washed 52%	22c.
Manganese, African, Indian, 44-48%	20c.
Manganese, African, Indian, 49-51%	21c.
Manganese, Brazilian, 46 to 48½	17c.
	Per Net Ton Unit
Tungsten, Chinese wolframite, duty paid*	$12.00
Tungsten, domestic scheelite*	$11.00 to $12.00
	Per Gross Ton
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard	16.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic seaboard	18.00

*Quotations nominal in absence of sales.

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines	$15.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	16.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	18.50
Domestic, No. 1 ground bulk, 85 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$12.50 to $13.00
No. 2 heavy melting steel	11.00 to 11.50
No. 2 railroad wrought	12.50 to 13.00
Scrap rails	12.50 to 13.00
Rails 3 ft. and under	15.00 to 15.50
Sheet car crops, ordinary	13.00 to 13.50
Compressed sheet steel	12.50 to 13.00
Hand bundled sheet steel	11.50 to 12.00
Hvy. steel axle turnings	11.00 to 11.50
Machine shop turnings	9.75 to 10.25
Short shov. steel turnings	9.75 to 10.25
Short mixed borings and turnings	8.50 to 9.00
Cast iron bornings	8.50 to 9.00
Cast iron carwheels	12.00 to 12.50
Heavy breakable cast	11.00 to 11.50
No. 1 cast	11.50 to 12.00
Railr. knuckles and couplers	14.00 to 14.50
Rail. coil and leaf springs	14.00 to 14.50
Rolled steel wheels	14.00 to 14.50
Low phos. billet crops	15.50 to 16.00
Low phos. sheet bar crops	15.00 to 15.50
Low phos. plate scrap	14.50 to 15.00
Low phos. punchings	15.00 to 15.50
Steel car axles	15.00 to 15.50

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$9.50 to $9.75
Shoveling steel	9.50 to 9.75
Hydraulic comp. sheets	$7.75 to $8.25
Drop forge flashings	7.25 to 7.75
No. 1 busheling	7.75 to 8.25
Rolled carwheels	11.00 to 11.50
Railroad tires	10.75 to 11.25
Railroad leaf springs	11.00 to 11.50
Axle turnings	8.00 to 8.50
Steel couplers and knuckles	10.50 to 11.00
Coil springs	11.50 to 12.00
Axle turnings (elec. fur.)	8.00 to 8.50
Low phos. punchings	11.50 to 12.00
Low phos. plates, 12 in. and under	11.50 to 12.00
Cast iron borings	6.00 to 6.50
Short shoveling turnings	6.00 to 6.50
Machine shop turnings	5.50 to 6.00
Rerolling rails	11.00 to 11.50
Steel rails, less than 3 ft.	11.50 to 12.00
Steel rails, less than 2 ft.	12.00 to 12.50
Angle bars, steel	10.50 to 11.00
Cast iron carwheels	10.00 to 10.50
Railroad malleable	9.50 to 10.00
Agricultural malleable	8.00 to 8.50

Per Net Ton

Iron car axles	$12.50 to $13.00
Steel car axles	11.00 to 11.50
No. 1 railroad wrought	8.25 to 8.75
No. 2 railroad wrought	8.25 to 8.75

No. 2 busheling	$4.00 to	$4.50
Locomotive tires, smooth	9.00 to	9.50
Pipe and flues	4.75 to	5.25
No. 1 machinery cast	10.00 to	10.50
Clean automobile cast	10.00 to	10.50
No. 1 railroad cast	9.50 to	10.00
No. 1 agricultural cast	8.75 to	9.25
Stove plate	7.00 to	7.50
Grate bars	6.75 to	7.25
Brake shoes	8.75 to	9.25

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$10.50 to	$11.00
No. 2 heavy melting steel	9.00 to	9.50
No. 1 railroad wrought	....	12.00
Bundled sheets	8.50 to	9.00
Hydraulic compressed, new	10.50 to	11.00
Hydraulic compressed, old	8.50 to	9.00
Machine shop turnings	....	8.00
Heavy axle turnings	....	9.50
Cast borings	....	7.00
Heavy breakable cast	10.50 to	11.00
Stove plate (steel works)	....	9.50
No. 1 low phos. heavy	....	15.00
Couplers and knuckles	....	14.00
Rolled steel wheels	....	14.00
No. 1 blast furnace	6.00 to	6.50
Spec. iron and steel pipe	....	10.00
Shafting	15.00 to	15.50
Steel axles	13.50 to	14.00
No. 1 forge fire	....	10.50
Cast iron carwheels	12.50 to	13.00
No. 1 cast	12.00 to	13.00
Cast borings (chem.)	12.00 to	14.00
Steel rails for rolling	12.00 to	12.50

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$10.50 to	$11.00
No. 2 heavy melting steel	10.25 to	10.75
Compressed sheet steel	9.50 to	10.00
Light bundled sheet stampings	6.50 to	7.00
Drop forge flashings	9.50 to	10.00
Machine shop turnings	7.00 to	7.50
Short shoveling turnings	7.50 to	8.00
No. 1 busheling	9.50 to	10.00
Steel axle turnings	7.50 to	8.00
Low phos. billet crops	12.50 to	13.00
Cast iron borings	7.50 to	8.00
Mixed borings and short turnings	7.50 to	8.00
No. 2 busheling	7.25 to	7.75
No. 1 cast	11.00 to	11.50
Railroad grate bars	6.50 to	7.00
Stove plate	7.50 to	8.00
Rails under 3 ft.	10.00 to	10.50
Rails for rolling	10.50 to	11.00
Railroad malleable	10.00 to	10.50
Cast iron carwheels	....	11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	....	$10.00
No. 2 heavy melting scrap	....	9.00
Scrap rails	$8.75 to	9.25
New hydraul. comp. sheets	....	9.00
Old hydraul. comp. sheets	....	8.50
Drop forge flashings	....	9.00
No. 1 busheling	....	9.00
Hvy. steel axle turnings	8.50 to	9.00
Machine shop turnings	6.50 to	7.00
Knuckles and couplers	11.50 to	12.00
Coil and leaf springs	11.50 to	12.00
Rolled steel wheels	11.50 to	12.00
Low phos. billet crops	12.50 to	13.00
Short shov. steel turnings	7.00 to	7.50
Short mixed borings and turnings	6.50 to	7.00
Cast iron borings	6.50 to	7.00
No. 2 busheling	6.00 to	6.50
Steel car axles	11.00 to	12.00
Iron axles	11.00 to	12.00
No. 1 machinery cast	11.00 to	11.50
No. 1 cupola cast	11.00 to	11.50
Stove plate	8.75 to	9.25
Steel rails, 3 ft. and under	12.50 to	13.00
Cast iron carwheels	10.00 to	10.50
Industrial malleable	11.50 to	12.00
Railroad malleable	11.50 to	12.00
Chemical borings	9.00 to	10.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$10.00 to	$10.50
Scrap steel rails	....	9.50
Short shoveling turnings	....	5.50
Stove plate	7.00 to	7.50
Steel axles	11.00 to	11.50
Iron axles	11.00 to	11.50
No. 1 railroad wrought	7.00 to	7.50
Rails for rolling	....	10.50
No. 1 cast	9.50 to	10.00
Tramcar wheels	9.50 to	10.00
Cast iron borings, chem.	....	8.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$10.00 to	$10.50
No. 1 heavy melting	9.00 to	9.50
No. 2 heavy melting	8.25 to	8.75
No. 1 locomotive tires	8.50 to	9.00
Misc stand.-sec. rails	10.00 to	10.50
Railroad springs	10.00 to	10.50
Bundled sheets	6.00 to	6.50
No. 2 railroad wrought	8.75 to	9.25
No. 1 busheling	6.50 to	7.00
Cast iron borings and shoveling turnings	4.75 to	5.25
Rails for rolling	10.50 to	11.00
Machine shop turnings	4.50 to	5.00
Heavy turnings	5.50 to	6.00
Steel car axles	11.50 to	12.00
Iron car axles	12.50 to	13.00
Wrot. iron bars and trans.	9.50 to	10.00
No. 1 railroad wrought	7.00 to	7.50
Steel rails less than 3 ft.	11.50 to	12.00
Steel angle bars	10.00 to	10.50
Cast iron carwheels	9.00 to	9.50
No. 1 machinery cast	9.00 to	9.50
Railroad malleable	9.50 to	10.00
No. 1 railroad cast	9.00 to	9.50
Stove plate	7.00 to	7.50
Relay rails, 60 lb. and under	16.00 to	16.50
Relay rails, 60 lb. and over	$20.00 to	$21.00
Agricult. malleable	9.00 to	9.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.00 to	$7.50
Scrap T rails	6.75 to	7.25
Machine shop turnings	4.00 to	4.25
Cast iron borings	4.00 to	4.25
Bundled skeleton, long	5.50 to	6.00
Forge flashings	4.75 to	5.00
Blast furnace scrap	4.75 to	5.00
Shafting	9.00 to	9.50
Steel car axles	8.50 to	9.00
Wrought pipe	3.50 to	4.00
Rails for rerolling	6.00 to	6.50
Cast iron borings, chemical	11.00 to	11.50

Per gross ton delivered consumers' yards:

Textile cast	$10.00 to	$10.25
No. 1 machinery cast	10.00 to	10.25
Stove plate	6.25 to	6.50
Railroad malleable	11.00 to	12.00

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.00 to	$8.00
No. 2 heavy melting steel	6.00 to	7.00
Unprepared yard iron and steel	3.50 to	4.00
No. 1 heavy breakable cast	6.00 to	6.25
Machine shop turnings	..	3.50
Short shoveling turnings	..	3.50
Cast borings	4.50 to	4.75
No. 1 blast furnace	3.50 to	4.00
Steel car axles	10.00 to	10.50
Spec. iron and steel pipe	$4.50 to	$5.00
Forge fire	5.50 to	6.00
No. 1 railroad wrought	7.50 to	8.00
No. 1 yard wrought, long	6.50 to	7.00
Rails for rolling	8.50 to	9.00
No. 1 cast	7.00 to	7.50
No. 2 cast	6.50 to	7.00
Stove plate	6.00 to	6.50
Cast borings (chemical)	12.00 to	12.50

Per gross ton, delivered local foundries:

No. 1 machinery cast		$10.00
No. 1 hvy. cast (cupola size)		9.00
No. 2 cast		8.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$9.00 to	$9.50
Scrap rails for melting	9.25 to	9.75
Loose sheet clippings	5.00 to	5.50
Bundled sheets	6.00 to	6.50
Cast iron borings	6.00 to	6.50
Machine shop turnings	5.50 to	6.00
No. 1 busheling	7.00 to	7.50
No. 2 busheling	3.50 to	4.00
Rails for rolling	9.50 to	10.00
No. 1 locomotive tires	8.50 to	9.00
Short rails	11.25 to	11.75
Cast iron carwheels	8.50 to	9.00
No. 1 machinery cast	9.50 to	10.00
No. 1 railroad cast	9.00 to	9.50
Burnt cast	7.00 to	7.50
Stove plate	7.00 to	7.50
Agricultural malleable	8.75 to	9.25
Railroad malleable	9.25 to	9.75

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$8.00 to	$8.50
Borings and short turnings	6.00 to	6.50
Long turnings	5.50 to	6.00
No. 1 machinery cast	7.75 to	8.25
Automotive cast	9.50 to	10.00
Hydraul. comp. sheets	8.00 to	8.50
Stove plate	5.75 to	6.25
New factory busheling	7.00 to	7.50
Old No. 2 busheling	5.00 to	5.50
Sheet clippings	5.50 to	6.00
Flashings	6.25 to	6.75
Low phos. plate scrap	8.75 to	9.25

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$5.50	$5.50
Rails, scrap	6.00	4.50
Machine shop turnings	2.50	2.50
Boiler plate	4.50	4.50
Heavy axle turnings	2.50	2.50
Cast borings	3.00	3.00
Steel borings	2.00	2.00
Wrought pipe	2.50	2.50
Steel axles	4.50	6.00
Axles, wrought iron	4.50	6.50
No. 1 machinery cast	7.75	9.00
Stove plate	4.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	3.20c.
Squares and flats	3.20c.
Hoops and bands, under ¼ in.	2.95c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.50c.
Hot-rolled sheets (No. 10)	2.50c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.32
Spikes, large	2.40c.
Small	2.65c.
Boat	2.90c.
Track bolts, all sizes, per 100 count,	70 per cent off list.
Machine bolts, 100 count,	70 per cent off list.
Carriage bolts, 100 count,	70 per cent off list.
Nuts, all styles, 100 count,	70 per cent off list.
Large rivets, base per 100 lb.	$3.25
Wire, black, soft ann'l'd, base per 100 lb.	2.90
Wire, galv. soft, base per 100 lb.	3.35
Common wire nails, per keg	2.45
Cement coated nails, per keg	2.45

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Cold-fin. steel bars and shafting	
Rounds and hexagons	3.25c.
Flats and squares	3.25c.
Bands, 3/16 in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 24)	3.45c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	2.85c.
Spikes (9/16 in. and lighter)	3.45c.
Track bolts	4.30c.
Rivets, structural (keg lots)	3c.
Rivets, boiler (keg lots)	3c.
	Per Cent Off List
Machine bolts	65
Carriage bolts	65
Coach and lag screws	70
Hot-pressed nuts, sq., tap. or blank.	65
Hot-pressed nuts, hex., tap. or blank.	65
Hex. head cap screws	80 and 10
Cup point set screws	75
Flat head bright wood screws	50 and 10
Spring cotters	60 and 10
Stove bolts	72½
Rd. hd. tank rivets, 7/16 in. and smaller	65
Wrought washers	$5.50 off list
No. 8 black ann'l'd wire per 100 lb.	$3.45
Com. wire nails, base per keg	2.55
Cement c't'd nails, base per keg	2.55

NEW YORK

	Base per lb.
Plates and struc. shapes	3.10c.
Soft steel bars, small shapes	3.10c.
Iron bars	3.24c.
Iron bars, swed. charcoal	6.00c. to 6.50c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.79c.
Flats and squares	4.29c.
Cold-roll. strip, soft and quarter hard	4.55c.
Hoops	3.30c.
Bands	3.30c.
Hot-rolled sheets (No. 10)	3.00c.
Hot-rolled ann'l'd sheets (No. 24*)	3.65c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	4.50c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.60c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open hearth spring steel, bases	3.75c. to 10.00c.
Common wire nails, base, per keg	$2.90
	Per Cent Off List
Machine bolt, cut thread:	
¾ x 6 in. and smaller	65
1 x 30 in. and smaller	65
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65
⅝ x 20 in. and smaller	65
Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounds, shafting, screw stock	3.61c.
Hot-rolled annealed sheets (No. 24)	3.60c.
Galv. sheets (No. 24)	4.25c.
Hot-rolled sheets (No. 10)	3.10c.
Black corrug. sheets (No. 24)	3.65c.
Galv. corrug. sheets	4.30c.
Structural rivets	3.25c.
Boiler rivets	3.25c.
	Per Cent Off List
Tank rivets, 7/16 in. and smaller	65
Machine and carriage bolts, lag screws, fitting up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts	
1000 lb. or over	65
200 to 999 lb.	60
100 to 199 lb.	55
Less than 100 lb.	50

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	2.60c.
*Structural shapes	2.60c.
*Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform.	2.30c.
Cold-finished steel bars	3.60c.
*Steel hoops	3.15c.
*Steel bands, No. 12 to 3/16 in., incl.	2.90c.
Spring steel	5.00c.
†Hot-rolled annealed sheets (No. 24)	3.30c.
†Galvanized sheets (No. 24)	3.75c.
*Hot-rolled annealed sheets (No. 10)	2.75c.
Diam. pat. floor plates, ¼ in.	4.35c.
Swedish iron bars	6.00c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deductions on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 2.35c.
Cold-fin. steel bars:	
Rounds, squares, hexagons	3.25c.
Flats	3.40c.
Flat rolled steel under ¼ in.	3.00c.
Cold-finished strip	5.55c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galvanized sheets (No. 24)	3.85c.
Hot-rolled sheets (No. 10)	2.75c.
Black ann'l'd wire, per 100 lb.	$2.55
No. 9 galv. wire, ner 100 lb.	2.90
Com. wire nails, base per keg	2.35

*Net base, including boxing and cutting to length.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinforc. bars	3.00c.
Rail steel reinforc. bars	3.00c.
Hoops	3.75c.
Bands	3.20c.
Cold-finished bars	3.57c.
Hot-rolled annealed sheets (No. 24)	3.60c.
Galv. sheets (No. 24)	4.15c.
Hot-rolled sheets (No. 10)	3.05c.
Structural rivets	4.00c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, 1-in., per 100 lb.	7.15
	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$16.91
4-in.	37.41
Hot-welded steel boiler tubes, 2-in.	15.79
4-in.	34.88

BUFFALO

	Base per Lb.
Plates and struc. shapes	3.20c.
Soft steel bars	2.95c.
Reinforcing bars	1.95c.
Cold-fin. flats and sq.	3.25c.
Rounds and hex.	3.25c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galv. sheets (No. 24)	4.00c.
Bands	3.30c.
Hoops	3.55c.
Hot-rolled unannealed sheets	3.10c.
Com. wire nails, base per keg	$3.00
Black wire, base per 100 lb.	3.35

BOSTON

	Per Lb.
*Beams, channels, angles, tees, zees	2.75c.
*H beams and shapes	2.75c.
*Plates—sheared, tank and univ. mill, ¼ in. thick and heavier	2.75c.
*Floor plates, diamond pattern	4.65c.
*Bar and bar shapes (mild steel)	2.65c.
*Bands 3/16 in. thick and No. 12 ga. incl.	3.15c. to 3.65c.
Hoops, No. 14 ga. and lighter	4.90c. to 5.40c.
*Half rounds, half ovals, ovals and bevels	3.90c.
Tire steel, rd. edge 1½ x ½ in. and larger	4.50c.
Smaller sizes	4.75c.
Cold-finished rounds and hexagons	3.70c.
Cold-rolled strip steel	5.30c.
Cold-finished squares and flats	4.20c.
*Blue annealed sheets, No. 10 ga.	2.65c.
One pass cold-rolled sheets No. 24 ga.	3.50c.
Blued stove pipe sheets, No. 24 ga.	3.90c.
Galvanized steel sheets No. 24 ga.	4.00c.
Lead coated (long ternes) No. 24 ga.	5.00c.

Base prices for 40,000 lb. orders; extras apply for smaller quantities.

PACIFIC COAST

	Base per Lb.		
	San Francisco	Los Angeles	Seattle
Plates, tank and U.M.	3.30c.	3.30c.	3.30c.
Shapes, standard	3.30c.	3.30c.	3.30c.
Wide-flanged beams and columns	3.50c.	3.50c.	3.50c.
Soft steel bars	3.30c.	3.30c.	3.30c.
Reinforcing bars	3.15c.	3.15c.	3.00c.
Hot-rolled annealed sheets (No. 24)	4.15c.	4.05c.	4.15c.
Hot-rolled sheets (No. 10)	3.53c.	3.45c.	3.75c.
Galv. sheets (No. 24)	4.75c.	4.65c.	4.15c.
Struc. rivets, ½ in. and larger	5.75c.	5.75c.	5.25c.
Cold finished steel			
Rounds	5.85c.	5.85c.	5.85c.
Squares and hexagons	7.10c.	7.10c.	7.10c.
Flats	7.60c.	7.60c.	7.60c.
Common wire nails —base per keg	$2.90	$3.00	$2.90
less carload			

All items subject to differentials for quantity.

WYCKOFF

DEPENDABLE COLD DRAWN STEELS

THE RAPID DUPLICATION OF MACHINED STEEL PARTS AT LOWEST COST CONTINUES TO DEPEND UPON THAT PERFECTION AND PRECISION WHICH ONLY COLD DRAWN STEELS CAN GIVE.

That is why manufacturers, users and operators of automatic screw machines always specify **cold drawn steels** to attain the full production and profit advantages from their equipment.

In this period of exceptionally close margins,—you cannot afford to take chances with an inferior product. Only through the use of **cold drawn steel bars** can you obtain the increased physical characteristics, exactness to size, straightness and guaranteed machining performance so essential to the maintenance of present-day production costs.

The WYCKOFF organization will welcome an opportunity of cooperating with you,—any time.

Wyckoff Drawn Steel Company

WYCO COLD FINISHED STEELS

GENERAL OFFICES: AMBRIDGE, PA.

CHICAGO OFFICES: 3200 SOUTH KEDZIE AVE.

MILLS: AMBRIDGE, PA., CHICAGO, ILL.

Less-Carload Extras on Sheets Are Revised

STANDARD size quantity extras on hot-rolled, hot-rolled annealed and galvanized sheets in less-carload lots have been revised since the original filing of extras under the code, necessitating certain changes on page 26-S of THE IRON AGE special price and extra supplement. The new extras on hot-rolled and hot-rolled annealed sheets are as follows:

Less Carload — Standard and odd sizes (total quantities)
10,000 lb. and over—no charge
Under 10,000 lb. to 5,000 lb. 10c. per 100 lb.
Under 5,000 lb. to 2,500 lb. 20c. per 100 lb.
Under 2,500 lb. to 1,000 lb. 30c. per 100 lb.
Under 1,000 lb. 50c. per 100 lb.

In addition to the quantity extras for less-carload lots for both standard and odd sizes add an extra of 10c. per 100 lb. to apply to each item of odd size ordered.

When odd size shipped, 10 per cent over or under each item of quantity ordered is permissible.

If exact quantity required, add 10c. per 100 lb.

Galvanized Sheets

Quantity extras on galvanized sheets are as follows:

Carload Lots—Standard sizes any quantity no extra. Odd sizes under 20 bundles (3,000 lb.) 10c. per 100 lb. extra.

Less Carload Lots—Standard and odd sizes (total quantities)

Less carload to	Per 100 lb. extra
15,000 lb.	10c.
Under 15,000 lb. to 9,000 lb.	25c.
Under 9,000 lb. to 3,750 lb.	35c.
Under 3,750 lb. to 1,500 lb.	50c.
Under 1,500 lb.	75c.

Item extras for odd sizes, 10c. per 100 lb.

Cold-Rolled Seconds

A change in the selling of cold-rolled sheet seconds has also been made, allowing the consumer who cannot use such seconds to secure all primes by paying an extra of 25c. per 100 lb.

Discuss Rail Purchases With Federal Officials

WASHINGTON, Sept. 26.—Competitive bids for a minimum of between 600,000 and 700,000 tons of steel rails are to be submitted by manufacturers as the result of a White House conference yesterday. The conference was called by President Roosevelt, and it is said to represent the beginning of a movement to stimulate reemployment and purchasing power by means of capital goods purchases.

Attending the conference regarding the steel rail purchase plan were Myron C. Taylor, chairman, United States Steel Corpn.; Eugene G. Grace, president, Bethlehem Steel Corpn.; L. E. Block, chairman, Inland Steel Co.; Arthur Roeder, receiver, Colorado Fuel & Iron Co., and Government officials who are directly interested in the program, including Transportation Coordinator Joseph B. Eastman and General Counsel Donald Richberg of the NRA. The administrator, for some time, has suggested that large purchases of rails would be made if the price of $40 a gross ton were reduced. It was said authoritatively this morning that no specific price has been mentioned. Instead, it was emphasized that the price will be determined by competitive bids, to be supervised by Public Works Administrator Ickes.

Money for the purchase would be obtained from the Public Works Administration and supplied to the railroads at a low rate of interest. Mr. Eastman has consistently urged the carriers to make heavy expenditures for maintenance through loans from this source.

The rail move is said to be tied directly with plans that have been virtually completed to enter upon a large capital goods program, including purchase through Government funds of railroad equipment, such as locomotives, and the financing of slum clearance and other construction projects. This move is held to be vital as a means of supporting the NRA effort.

Increase in Employment at Detroit

EMPLOYMENT at Detroit on Sept. 15 measured 64.5 on the index of the local Board of Commerce, compared with 44.7 at the same time in 1932. At the lowest point of the year, on March 15, it was 33.5.

Ninety-one companies in the automobile industry in Michigan had, 189,878 workers on their payrolls during August, as against 172,757 in July and 160,944 in August of last year. Their aggregate payrolls amounted to $4,400,317, compared with $4,119,473 in July and $3,111,106 in August, 1932.

Tool and Die Makers Strike in G. M. Plants

DETROIT, Sept. 26.—Approximately 2000 tool and die makers employed by the Chevrolet, Buick and AC Spark Plug divisions of General Motors Corp. went out on strike Friday, demanding higher wages. The striking workers are members of the Mechanics' Educational Society, which is not affiliated with the American Federation of Labor. Detroit members of the society are now taking a vote to determine whether to issue a strike call.

Railroad Equipment

General American Transportation Corpn. will build 12 flat cars for Inland Steel Co.

American Car & Foundry Co. will build six steel hopper cars for Electro-Metallurgical Co.

Louisville & Nashville Railroad has sold 4380 units of obsolete and depreciated rolling stock for scrap. Sale included 251 locomotives, 3671 freight cars and 368 units of work equipment, and original cost was $7,000,000. Dismantling will be done at railroad's plant, South Louisville, Ky.

Indianapolis Railways, Indianapolis, have purchased 80 trackless trolley cars, and 50 street cars from J. G. Brill Co. and the General Electric Co. Street cars will be equipped with four type GE-702, PCM foot-operated control with field shunting, and air brakes with G. E. type CP-27 compressors. Trolley coaches will be equipped with two type GE-1154 motors, PCM control, and air brakes with CP-25 compressors.

Exhibitors at the National Metal Congress

(*Concluded from page* 41)

gears. These items will be built into a special display which will be semi-operated.

Udylite Process Co., Detroit. Booth 121.

Una Welding, Inc., Cleveland. Booth 127.

Union Carbide & Carbon Corpn., New York. Booth 120.
Exhibiting (in operation): Products of various units of Union Carbide & Carbon Corpn., including Linde oxygen, Prest-O-Lite acetylene, Union carbide, Oxweld welding and cutting apparatus, National Carbon products, Haynes Stellite, Hascrome, Hastelloy, Haystellite and Electromet ferro-alloys and metals.

United States Steel Corpn. (American Sheet & Tin Plate Co., American Steel & Wire Co., Carnegie Steel Co., Illinois Steel Co., National Tube Co.) Booth 126.
Exhibiting: Various finished products manufactured from alloy steels, USS stainless and heat resisting steels, and USS Plykrome steels.

Vanadium Corpn. of America, New York. Booth 6.

Vapofier Corpn., Chicago. Booth 116.
Exhibiting (in operation): The Vapofier, a device for changing a distillate fuel from a liquid state to a gaseous state and mixing this hydro-carbon gas with air in combustible proportions. The Vapofier will be exhibited as applied to two high speed steel treating furnaces, complete with automatic temperature volume and quality control as successfuly installed and operated in many well known treating plants formerly using gas heat.

Victor Saw Works, Inc., Middletown, N. Y. Booth 55.

Weldit Acetylene Co., Detroit. Booth Gas Section.

Wickwire Spencer Steel Co., New York. Booth 40.
Exhibiting: Samples of Wissco wires and springs, which are particularly adapted to the requirements of the automotive and allied industries. These include music, stainless steel, black oil tempered, valve spring steels, shaped, machinery spring and rope wire, together with springs and wire forms. Display boards showing Wissco wire conveyor belts, stressing the many patented Wissco features, together with engineering charts developed through extensive research, showing tangible performance data.

Wilson Welder & Metals, Inc., North Bergen, N. J. Booth 101.

Youngstown Sheet & Tube Co., Youngstown, Ohio. Booth 54.
Exhibiting (in operation): In addition to an interesting metallography exhibit, we will show illuminated, hand colored, transparencies of views incident to the manufacture of steel. A feature of the exhibit will be a complete operating scale model of a tube mill, which will actually make small pipe. One will be able to conceive the manufacture of pipe by viewing this model as well as by a special trip to the mill.

Ziv Steel & Wire Co., Chicago. Booth 20-A.

Machine Tool Builders to Get Hearing Oct. 2—Other Codes Being Submitted

WASHINGTON, Sept. 26.—A hearing on the code of fair competition submitted by the National Machine Tool Builders' Association will be held at the Willard Hotel next Monday before Deputy Administrator Malcolm Muir. The code was published in full in THE IRON AGE of Aug. 31.

It fixes a minimum wage of 40c. an hr. unless the rate was lower on July 15, 1929, but in no event less than 35c. an hr. This rate applies to employees engaged in the processing of the products of the industry. For other employees the rate is fixed at $15 a week. The maximum work week is 40 hr. for shop employees, with a seasonal tolerance not to exceed 48 hr. for any six weeks in a six months' period. Time and one-third is to be paid for overtime.

On Oct. 9, Deputy Muir will preside at a hearing on the code for the construction machinery distributing trade. It proposes a maximum work week of 40 hr. for shop workers with a tolerance of 10 per cent and a minimum hourly rate of 40c.

Cast Iron Pipe Hearing Oct. 9

Deputy Administrator H. O. King will have charge of a hearing on Oct. 9 on a code submitted by the cast iron pressure pipe industry. The proposed code fixes a maximum work week of 36 hr., based on a six months' period, with a maximum of 40 hr. for any period within the six months. It also proposes a five-day week with time and a half for overtime. The minimum pay set for labor in any plant is not to be less than the minimum hourly rate on July 15, 1929, in the same plant. It is in no event to be less than 30c., except as to superannuated employees and apprentices and when a State law specifies a higher minimum.

Deputy Muir also will preside at a hearing on Oct. 12 on the code of the paper-making machine builders. It fixes a maximum work week of 40 hr., and not more than 8 hr. in any 24 hr. for those engaged in making products of the industry, who would be paid 40c. an hr.

Among other codes set for hearings at which Mr. Muir will preside are:

Sept. 28.—Code of Steel Tubular and Firebox Industry. Minimum hourly wage, except for watchmen and cleaners, 35c. in North; 30c. in South. Maximum work week, 40 hr., averaged over six-month period; not to exceed 48 hr. in any one week.

Sept. 29.—Code of Shovel, Dragline and Crane Industry. Maximum work week, 40 hr. on semi-yearly average; not more than 48 hr. in any one week for not more than eight weeks in six-month period, for factory employees. Minimum wage, 35c. per hr.

Oct. 4.—Code of Plumbago Crucible Industry. Maximum work week of 40 hr., with certain exceptions, including kiln burners; not more than 48 hr. in any one week of any one month in case of temporary burden of production; such employees to be paid time and one-half for work in excess of any consecutive 9-hr. period; minimum hourly rate for factory employees, 40c.

Oct. 5.—Code of Coated Abrasive Industry. Maximum work week, 40 hr., averaged over any period of 26 weeks, no employee to work more than 48 hr., with exception of employees of departments of continuous operations where technical or chemical control is necessary for preservation. Latter employees shall not work more than 40-hr. average in any 26-week period. Minimum hourly wage, 36c., unless less on July 15, 1929, no less than 30c. in any case.

Steel Barrel Output Declined in August

WASHINGTON, Sept. 26.—Production of steel barrels in August declined to 480,670 units, or 35.5 per cent of capacity, compared with 555,404 or 41 per cent of capacity in July, according to reports received by the Bureau of the Census from 26 establishments. Shipments in August totaled 470,632 barrels against 552,923, and stocks at the end of the month were 38,706 units compared with 28,668 at the end of July. Unfilled orders at the end of August for delivery within 30 days totaled 159,227 against 286,702 at the end of July. Unfilled orders at the end of August for delivery beyond 30 days totaled 375,322 against 361,222 at the end of July.

In the first eight months of the current year production of steel barrels totaled 3,410,725, compared with 3,428,445 in the corresponding period of last year.

Steel Furniture and Shelving Orders Rise

WASHINGTON, Sept. 26.—Orders for business steel furniture in August were valued at $836,957, against $606,876 in July, according to reports received by the Bureau of the Census from 32 establishments. Unfilled orders at the end of August were $684,444, the largest since November, 1931. In the first eight months of 1933 orders aggregated $4,541,301 against $5,618,022 in the corresponding period of last year.

Orders for shelving steel furniture in August totaled $194,223 compared with $180,245 in July, according to reports received from 14 establishments. Unfilled orders at the end of August were valued at $221,547 against $206,012 at the end of July. In the first eight months of the current year orders totaled $1,247,391 against $1,513,733 in the corresponding period of 1932.

HY-TEN "B" TEMPER NO. 3X ANALYSIS

For machining at exceptionally high degrees of heat-treated hardness thus avoiding scaling and distortion. Stock or mill shipment. Data sheets gladly mailed on request.

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CAMBRIDGE CHICAGO CLEVELAND NEW YORK

PLANT EXPANSION AND EQUIPMENT BUYING

NEW ENGLAND

State Department of Mental Diseases, State House, Boston, plans new power plant at State hospital, Northampton, Mass. Cost over $85,000 with equipment. Edward C. Brown Co., 77 Summer Street, Boston, is consulting engineer.

Board of Public Works, Worcester, Mass., plans installation of pumping machinery and other equipment, pipe lines, etc., in connection with extensions and improvements in municipal water system. Financing for $140,000 is being arranged for work.

Metro Machinery Mfg. Co., Inc., Boston, has been organized by Herbert L. Reder and Anthony Loungo, 20 Meridian Street, East Boston, to manufacture machinery and parts.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 3 for four motor-driven single spindle automatic screw machines (Schedule 738-R) for Newport, R. I., Navy Yard.

Firestone Tire & Rubber Co., 673 Connecticut Boulevard, East Hartford, Conn., headquarters at Akron, Ohio, plans multi-story factory branch, storage and distributing plant at Hartford. Cost over $150,000 with equipment.

Yale Brewing Co., 740 Main Street, Hartford, Conn., A. C. Wagner, president, has filed plans for addition, 118 x 500 ft., including one-story boiler house, refrigerating plant and other units. Cost over $100,000 with equipment.

Hofmann Hook Fast Specialties, Inc., Providence, R. I., has been organized by Herbert Hofmann, 500 Angell Street, and associates, to manufacture metal products.

NORTH ATLANTIC

Brooklyn Bottling & Distributing Co., Inc., 71 Beaver Street, Brooklyn, will take bids soon on general contract for new five-story brewing plant, 81 x 200 ft. Cost about $300,000 with equipment. Koch & Wagner, 32 Court Street, are architects.

Port of New York Authority, Eighth Avenue and Fifteenth Street, New York, John E. Ramsey, general manager, asks bids until Oct. 9 for steel bolts and nuts for cast steel and cast iron tunnel lining, 8000 ft., for new traffic tunnel under Hudson River, from Thirty-ninth Street, Manhattan, to Weehawken, N. J., for which financing in amount of $37,500,000 has been arranged.

Thermo-Mix, Inc., Sea Cliff, L. I., has been organized by Fred H. Maidment and Errol W. Doebler, Sea Cliff, to manufacture thermostatic valves and kindred engineering specialties.

Interboro Beverage Corpn., 165-207 Melrose Street, Brooklyn, is continuing expansion program, recently noted in these columns, and has engaged same architects, Shampan & Shampan, 188 Montague Street, to draw plans for new four-story bottling plant on site 100 x 200 ft. Cost over $450,000 with equipment. Edward M. Blumenkranz is president.

Public Works Officer, Navy Yard, Brooklyn, has asked bids on general contract for addition to structural shop, building No. 4, for which appropriation of $50,000 was recently authorized.

Coast Guard Headquarters, Washington, has secured following appropriations for new stations with equipment in New York: Oak Island Beach, $35,000; Ditch Plain, $30,000; Big Sandy, $35,000; Long Beach, boat house and launchway, $20,000. Bids will soon be asked.

Battenville Mills, Inc., Battenville, N. Y., recently organized, has taken over former local mill of Phoenix Paper Co. for new plant. Plans under way for improvements and additional machinery for tissue stock manufacture. George E. Smith, Fort Edward, N. Y., formerly connected with International Paper Co., and Henry J. Wiser, Westport, Conn., head new company.

Allied Brewing & Distilling Co., 192 King Street, Brooklyn, plans extensions and improvements in plant at Eagle Avenue and 161st Street, New York. Cost over $50,000 with equipment. A. Jordan Bernstein, 1350 Broadway, New York, is engineer.

Boat Engines, Inc., Queens, L. I., has been organized by Meredith H. Coleman, 307 West Ninety-seventh Street, New York, and associates, to manufacture marine engine products and operate a general machine shop.

United Fruit Co., Pier 3, North River, New York, let general contract through its subsidiary, Refrigerated Steamship Line, Inc., to S. S. Jacobs Co., Hildebrandt Building, Jacksonville, Fla., for one-story precooling plant, 150 x 423 ft., at Jacksonville, to be operated by subsidiary noted. Cost about $250,000 with equipment. S. Kenyon Drake, Barnett Bank Building, Jacksonville, is architect.

R. L. Watkins Co., Marion Building, Cleveland, manufacturer of drug specialties, etc., has leased former four-story plant of Ellis Adding Typewriter Co., 338 Elizabeth Avenue, Newark, N. J., for new main factory. Cleveland plant will be removed to new location and capacity increased.

Newark Refrigerating & Engineering Co., Newark, recently organized to manufacture refrigerating equipment and parts, has leased one-story building at 74-78 Garden Street for new plant.

Brockway Motor Co., Inc., 205 Frelinghuysen Avenue, Newark, manufacturer of motor trucks, with headquarters at Cortland, N. Y., has leased 20,000 sq. ft. in building at 178-92 Sherman Avenue for new factory branch, service and repair plant.

Ever-Ready Fire Detector Corpn., Newark, care of C. James Cottrell, 784 Broad Street, representative, has been organized by Harry B. Aldridge and associates, capital $100,000, to manufacture fire alarm equipment and devices.

Public Works Officer, Fourth Naval District, Philadelphia, asks bids until Oct. 4 for extensions in steam power house, including two new locomotive type boilers, pumps and accessories (Specifications 7097); electrical work, including new transformers and accessories, fire alarm system, etc. (Specifications 7096).

Coca-Cola Bottling Works, Sunbury, Pa., has let general contract to O. C. Peers, Richmond, Va., for new one-story bottling plant. Cost over $25,000 with equipment.

Eaton-Dikeman Co., Mount Holly Springs, Pa., has approved plans for extensions in paper mill, formerly property of Holly Glen Paper Mills, to double present capacity. Cost over $60,000 with equipment.

Board of School Commissioners, 407 Chestnut Street, Lancaster, Pa., plans manual training department in new multi-story high school. Cost about $1,000,000 and financing in that amount is being arranged.

SOUTH ATLANTIC

Florida Produce Terminal, Inc., Jacksonville, Fla., recently organized, Mark L. Hyde, vice-president, plans new citrus fruit terminal at Commodores Point, including multi-story precooling and refrigerating plant, and distributing terminal units. Complete loading, conveying and other mechanical-handling equipment will be installed. Cost about $500,000 with equipment. Loan for one-half this amount has been secured from Government for project.

Ethyl-Dow Chemical Co., Midland, Mich., recently organized as a subsidiary of Dow Chemical Co., Midland, and Ethyl Gasoline Corpn., 135 East Forty-second Street, New York, has let general contract to U. A. Underwood Co., Wilmington, N. C., for initial units of new plant at Kure Beach, Cape Fear Peninsula, near Wilmington, for production of special commercial bromines for ethyl gasoline manufacture. Cost about $1,000,000 with equipment. Willard Dow is president. Tide Water Power Co., Wilmington, has secured contract for power service at plant and will make extensions and improvements in transmission line in Kure Beach district for distance of 19 miles, including new power substation. Cost $75,000 with equipment.

Common Council, Calhoun Falls, S. C., plans installation of pumping machinery and other equipment, pipe lines, etc., for municipal water and sewer systems. Cost about $70,000. Financing is being arranged.

BUFFALO DISTRICT

Niagara Metropolitan Sewage Committee, Edward P. Lupfer, chairman, Buffalo, care of Department of Public Works, City Hall, is arranging Federal loan of $26,000,000 for sewage system along Niagara frontier for abatement of pollution of Lake Erie and Niagara River, to include group of sewage disposal plants, pumping stations, power stations, pipe lines and other structures. Plants will be built for service at Buffalo, Niagara Falls, Lockport, Tonawanda, Lancaster, Kenmore and other communities. Bids for equipment will be asked this fall.

Lehigh Valley Railroad Co., Auburn, N. Y., plans rebuilding part of engine house and shop facilities recently destroyed by fire. Loss about $25,000 with equipment. Main offices are at 143 Liberty Street, New York.

Riverside Brewing Co., Riverside, Ont., is considering new plant unit. Cost about $85,000 with equipment.

SOUTH CENTRAL

Northeast Kentucky Tipple Co., Ashland and Catlettsburg, Ky., C. J. Neekamp, general manager, has plans for new coal tipple on Ohio River at last noted place, with automatic dumping machine, 250-ft. conveyor and other mechanical-handling equipment. Plant will be arranged for handling sand and gravel, crushed limestone and other materials. Cost about $200,000 with machinery.

Department of Streets and Parks, Charles D. Evans, city commissioner, City Hall, Shreveport, La., plans new hangar with repair and reconditioning facilities at municipal airport. Financing is being arranged.

Ellisville Ice Co., Ellisville, Miss., plans erection of electric light and power plant for local commercial service. Cost over $70,000 with equipment.

Board of Education, Nashville, Tenn., plans manual training departments in new multi-story senior and junior high schools. Cost over $500,000 each. Special election has been called Nov. 16 to approve bonds for $2,000,000 for these and other schools.

Board of Public Works, Montgomery, Ala., plans installation of three deep-well pumping units and other pumping machinery and auxiliary equipment for extensions in water supply system. Fund of $70,000 has been authorized.

Common Council, Russellville, Ky., plans installation of pumping machinery and other equipment, pipe lines, etc., for municipal water and sewer system. Robert & Co., Inc., Bona Allen Building, Atlanta, Ga., is engineer.

OHIO AND INDIANA

City Council, Cleveland, has passed ordinance for $2,000,000 bond issue for expansion and improvements in municipal electric light and power plant, and project will be placed before voters at November general election for ratification. Department of Public Service, W. J. Kennedy, director, will be in charge.

Cleveland-Sandusky Brewing Co., 2600 Carroll Avenue, Cleveland, has plans for extensions and improvements in local plant, including one-story bottling works, 60 x 80 ft., and two-story unit, 60 x 125 ft. Cost about $125,000 with equipment. E. A. Broberg, Lorain Street Bank Building, is architect.

Abar Machine Products Co., Cleveland, has been organized by Russell D. Clippinger and George C. Mulvihill, 1001 Hippodrome Building, to manufacture machine specialties.

Common Council, Hamden, Ohio, plans installation of pumping machinery, pipe lines, elevated steel tank and tower of 100,000 gal. capacity, and other equipment for extensions and improvements in municipal water system. Cost about $57,000. A. E. Kimberly, 568 East Broad Street, Columbus, Ohio, is engineer.

Columbus Dental Mfg. Co., 634 Wager Street,

Courtesy of Philadelphia Gear Works Philadelphia, Pa.

OPERATION: TURNING 7 1/2 INCH O. D. GEAR BLANK.

MACHINE: 18 INCH LIBBY LATHE.

MATERIAL: STEEL FORGING.

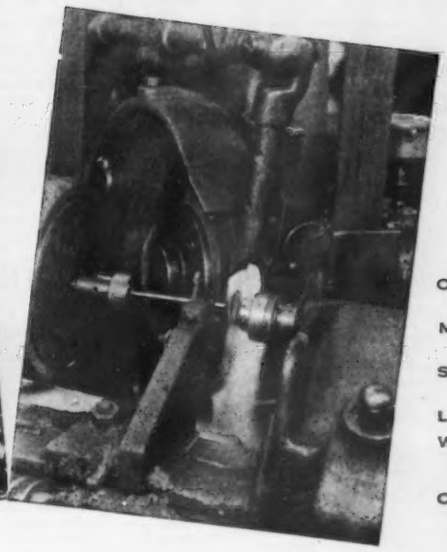
CUT: 7/8 INCH.

FEED: 1/32 INCH.

SPEED: 60 R. P. M.

LUBRICANT: 1 PART SUNOCO TO 10 PARTS WATER.

Courtesy of Wilcox-Rich Corporation Marshall, Michigan



OPERATION: FINISH GRIND VALVE SEAT

MACHINE: LANDIS GRINDER.

STOCK REMOVAL: .004 INCH.

LIMIT: .001 INCH.

WHEEL SIZE: 14 INCH DIAMETER, 3/4 INCH FACE.

COOLANT: 1 PART SUNOCO TO 40 PARTS WATER.

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NRA MEMBER U.S. WE DO OUR PART

Akron, Albany, Allentown, Atlantic City, Baltimore, Battle Creek, Beaumont, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Dayton, Detroit, Flint, Grand Rapids, Harrisburg, Jackson (Mich.), Jacksonville, Miami, Newark, New York, Philadelphia, Pittsburgh, Providence, Reading, Rochester, Scranton-Wilkes Barre, Syracuse, Tampa, Toledo, Trenton, Wilmington, Youngstown.

Subsidiary Companies:

Sun Company . . . Tulsa Sun Oil Co., Ltd., . . . Montreal and Toronto British Sun Oil Co., Ltd., . . . London, England.

Columbus, Ohio, has taken bids on general contract for two-story and basement addition, 48 x 100 ft., with foundations for third story later. Cost over $50,000 with equipment. R. R. Reeves, 203 East Broad Street, is architect.

Hoster Brewing Co., 100 Eldon Avenue, Columbus, Ohio, H. C. Tuller, Jr., in charge, plans new units, with installation of brew-house, bottling, mechanical-cooling and other equipment. Cost over $250,000 with machinery.

City Council, Sandusky, Ohio, C. Webb Sadler, city manager, has arranged ordinance for bond issue of $1,400,000 for municipal electric light and power plant, and project will be placed before voters for ratification at November general election.

Old Quaker Co., Lawrenceburg, Ind., has let general contract to Frank Messer & Sons, Inc., 2515 Burnet Street, Cincinnati, for three-story addition to distillery, including new still house. Cost over $70,000 with equipment. Company has also taken bids for new multi-story storage and distributing building to cost about $50,000 and will install conveying, loading and other equipment. Carl J. Kiefer, Schmidt Building, Cincinnati, is engineer.

Dwyer Products Corpn., Michigan City, Ind., has been organized by Lawrence P. Dwyer and Horace A. Soper, Michigan City, to manufacture iron and other metal castings.

WESTERN PENNA.

Hookless Fastener Co., Meadville, Pa., manufacturer of metal fasteners and kindred metal goods, has let general contract to George A. Rutherford Co., 2725 Prospect Avenue, Cleveland, for extensions and improvements in steam power plant. Award will soon be made for one-story addition to main plant, 60 x 300 ft. Cost over $150,000 with equipment. Wilbur Watson & Associates, 4614 Prospect Avenue, Cleveland, are architects.

Pittsburgh Coal Co., Oliver Building, Pittsburgh, let general contract to John F. Casey Co., Aspinwall, Pa., for new coal-loading docks on Beaver Creek, near Pennsylvania-Ohio State line. Cost about $100,000 with conveying, elevating, loading and other equipment.

Town Council, McMechen, W. Va., plans installation of pumping plant for extensions and improvements in water system, including centrifugal pumping units, air compressors, pipe lines, etc. Financing in amount of $85,000 is being arranged. E. J. Millar & Sons, McClain Building, Wheeling, W. Va., are consulting engineers.

West Virginia Water Service Co., Charleston, W. Va., plans one-story equipment storage and distributing plant at Montgomery. Improvements will be made in water system, including new settling tank unit, capacity 10,000 gal. F. P. Larmon is chief engineer.

MIDDLE WEST

General Household Utilities, Inc., 4127 George Street, Chicago, recently formed by merger of Grunow Corpn., Chicago, and United States Radio & Television Corpn., Marion, Ind., to manufacture radio equipment, electric household appliances, etc., has leased former plant of Alemite Corpn., 2638 North Crawford Avenue, Chicago, 163,000 sq. ft. floor space, for new factory, removing from first noted location.

Department of Public Property, Willis J. Spaulding, commissioner, Springfield, Ill., asks bids until Oct. 2 for one-story municipal light and power plant, including boiler house, 95 x 128 ft. Cost about $700,000 with equipment. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Crescent Machine & Tool Co., 2599 Ninth Street, Rockford, Ill., has been organized by Carl E. Carlberg and Gust R. Hedlund, to manufacture machinery and tools.

Faust Brewery Co., Stillwater, Minn., recently organized by J. N. Storr, 131 West Seventh Street, St. Paul, and associates, has taken over former industrial plant on South Main Street, Stillwater, and will modernize for new brewery. Brew-house, bottling, mechanical-cooling and other equipment will be installed. Cost over $100,000 with machinery.

Hiawatha Brewing Co., Inc., Thirty-first Street and Hiawatha Avenue, Minneapolis, recently formed by Helmar Knudsen, president, Lake Street Sash & Door Co., and associates, has plans for extensions and improvements in buildings formerly used by last noted company for new plant, including erection of two-story and basement bottling works, 40 x 200 ft., and another one-story building. Cost about $175,000 with equipment.

Common Council, Oakland, Iowa, asks bids until Oct. 9 for horizontal centrifugal pumping unit with accessories, turbine pumping unit and other equipment for extensions and improvements in municipal waterworks. Kenneth Young, Baum Building, Omaha, Neb., is consulting engineer.

George and Mathias Schmich Estates, Freeport, Ill., William H. and Frank Schmich, 1032 South Galena Avenue, in charge, has plans for expansion and modernization of brewery, with installation of brew-house, bottling and other equipment. Cost about $200,000 with machinery. Fridstein Engineering Co., 228 North La Salle Street, Chicago, is engineer.

Water and Light Commission, Hastings, Neb., has plans for extensions and improvements in municipal electric light and power plant. New equipment will be installed including 25-ton overhead traveling crane. Cost about $25,700. Perry T. Naylor is city engineer.

SOUTHWEST

Joseph T. Ryerson & Son, Inc., 2208 North Second Street, St. Louis, iron and steel products, with headquarters at Chicago, will soon take bids for one-story addition to local storage and distributing plant, with two-story office unit adjoining. Cost about $85,000 with equipment.

J. D. McQuillen, Okemah, Okla., is at head of project to erect new oil refinery near Kiowa, Okla., with storage and distributing department. Cost over $90,000 with equipment.

Board of Public Works, Oklahoma City, Okla., is considering new municipal power plant for service at city waterworks and for street-lighting system. Cost about $500,000 with equipment. Thomas G. Banks is city water superintendent.

Falstaff Brewing Corpn., 3684 Forest Park Boulevard, St. Louis, plans extensions and improvements, including new multi-story unit for storage and distribution, work to begin in October. Cost about $175,000 with equipment.

Common Council, California, Mo., plans new municipal electric light and power plant. Cost about $145,000 with equipment. W. B. Rollins & Co., Railway Exchange Building, Kansas City, Mo., are consulting engineers.

City Council, St. Charles, Mo., is arranging financing in amount of $350,000 for a municipal electric light and power plant. Russell & Axon, Roosevelt Building, St. Louis, are consulting engineers.

Kingsland Granite Co., Burnet, Tex., affiliated with Texas Quarries Co., Manor Road, plans new one-story mill for cutting, sawing, polishing, finishing, etc. Cost over $85,000 with equipment.

Common Council, Tomball, Tex., plans installation of pumping machinery and other equipment in new waterworks station and sewage plant. Cost about $50,000 with equipment. Also plans new one-story municipal ice-manufacturing plant to cost about $35,000 with machinery.

Board of Public Works, Dallas, Tex., John N. Eddy, city manager, plans installation of several pumping plants, two elevated steel tanks on steel towers of 2,000,000-gal. capacity, and other equipment for waterworks expansion and improvments. Cost over $1,000,000.

WASHINGTON DISTRICT

Baltimore Distilling Co., Russell and Alluvian Streets, Baltimore, has let general contract to Cogswell Construction Co., 406 Park Avenue, for three new units for distilling plant at Dundalk, Md. Cost over $75,000 with equipment. C. H. Osborne, 222 West Franklin Street, is engineer.

Prince George's Gas Corpn., a subsidiary of Washington Gas Light Co., 411 Tenth Street, N.W., Washington, now being organized to operate in Prince George County, Md., plans artificial gas holder, storage and distributing plant near District line, capacity 10,000,000 cu. ft., with distribution lines for service at Washington and points in Maryland. Cost about $675,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, has secured appropriation of $415,000 for extensions and improvements in dry dock No. 2, Norfolk, Va., Navy Yard; $325,000 for extensions and improvements in power plant at Washington Navy Yard, including equipment; $40,000 for new loading plant, largely machinery, at St. Juliens Creek, Va., Naval Station; $400,000 for replacements in transportation equipment and handling facilities at different navy yards. Bids will soon be asked.

Bureau of Supplies and Accounts, Navy Yard, Washington, asks bids until Oct. 3 for one tractor (Schedule 764) for Sewall's Point, Va., Navy Yard; 40,000 ft. lighting and power cable (Schedule 743) for Norfolk yard; 2600 bomb body steel forgings (Schedule 734) for Washington yard; six 15-ton hydraulic bolt forcers (Schedule 741) for Boston, Brooklyn, Philadelphia and Puget Sound yards; underwater sound transmitting equipments and spare parts (Schedule 735) for Eastern and Western yards.

MICHIGAN DISTRICT

National Standard Co., Niles, Mich., manufacturer of wire goods, jacks, etc., has approved plans for one-story addition, 54 x 160 ft., for wire plating works. Cost over $35,000 with machinery.

Park Brewery, Hancock, Mich., recently acquired by William O. Baysinger, 3901 North Frederick Avenue, Milwaukee, and associates, plans expansion and improvements, including new brew-house, bottling, mechanical-cooling and other equipment. Cost about $250,000 with machinery.

Vegetable Parchment Co., Parchment, Kalamazoo, Mich., plans three-story addition, 60 x 225 ft., for storage and distributing service. Cost about $40,000 with equipment. Company is also planning extensions and improvements in power plant, to include additional equipment.

Wayne Brewing & Distilling Co., Northville, Mich., C. Upton Shreve, secretary-treasurer, is arranging for purchase of plant and property of Silver Springs Water Co., Northville, for new distillery, with erection of new units and installation of equipment. Cost over $200,000 with machinery.

PACIFIC COAST

Union Oil Co. of California, Inc., Union Oil Building, Los Angeles, has approved plans for extensions and improvements in oil refinery at Oleum, Cal. Cost about $175,000 with equipment.

Arizona Carbonic Ice Co., Phoenix, Ariz., recently organized by John R. C. Long and John Redmond, Phoenix, has plans for new dry ice-manufacturing plant. Cost about $50,000 with equipment. Orvill A. Bell, Heard Building, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 3 for 375 ratchet braces (Schedule 703), dies, die stocks, tap wrenches, taps, threading sets, etc. (Schedule 704), files (Schedule 705), 300 machinists' squares and 180 rabbet planes (Schedule 706), 108 metallic measuring tapes and 900 folding caliper rules (Schedule 707), 732 sets jewelers' screw drivers (Schedule 708), 35 machinists' bench vises (Schedule 709), 612 adjustable pipe wrenches and 108 screw wrenches (Schedule 710), 11,020 doz. hacksaw tungsten blades (Schedule 714), 2000 pneumatic tool chisel blanks (Schedule 723) for Mare Island Navy Yard.

Public Works Officer, Puget Sound Navy Yard, Bremerton, Wash., asks bids until Oct. 9 for new machine and electrical shop (Specifications 7338). Appropriation of $1,350,000 recently made, including equipment.

Columbia Breweries, Inc., 2120 South C Street, Tacoma, Wash., plans expansion, including erection of new units. Cost over $200,000 with equipment. Elmer E. Hemrich is president and manager.

Eastern Oregon Brewing Co., LaGrande, Ore., care of J. W. DeYoung, 350 Salmon Street, Portland, architect, recently organized by W. M. McIntosh and George M. Singer, heads of Grande Ronde Meat Co., LaGrande, has plans for extensions and modernization of industrial buildings on Jefferson Street, for new brewery, including brew-house, bottling, conveying and other mechanical equipment. Cost about $100,000.

Southern California Edison Co., 601 West Fifth Street, Los Angeles, plans new transmission line at Newport Beach, Cal., and vicinity, including line over Newport Bay. Cost over $50,000.

Public Works Officer, Naval Operating Base, Air Station, San Diego, Cal., asks bids until Oct. 5 for new assembly shop (Specifications 7426). Appropriation of $175,000 recently made, including equipment.

Water Department, Spokane, Wash., plans extensions and improvements in municipal water system to cost $1,073,113, and work has been approved by City Council, including new power dam and hydroelectric power plant at Upriver Station, cost $612,820; new pumping plant and pipe lines in South Side district, $276,984; one-story equipment maintenance and repair building, $24,887; reservoir and other pumping stations, pipe lines, etc. Financing in amount noted is being arranged.

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Bright Annealing and Normalizing

(Concluded from Page 31)

above, finds its chief application in the copper and brass industries. For certain kinds of copper and copper alloys, a controlled-atmosphere electric furnace will produce a perfectly bright and brilliant product with no trace of oxide or scale. One of the interesting applications of this nature lies in the annealing of copper tubing, which must be bright and free from oxide, both inside and outside and which can be produced continuously in the electric furnace. It is also possible to take hot-rolled copper strip as it comes from the mills and anneal it continuously in the controlled-atmosphere furnace under conditions which will reduce the surface oxide and permit the further rolling of the strip down to the lightest gages, without pickling.

The controlled-atmosphere electric furnaces are also suitable for the bright annealing or normalizing of silver, nickel, monel and German silver parts. These products may all be heated with a total absence of scale and a retention of the original surface brilliance.

In the foregoing brief summary, no mention has been made of carburizing or decarburizing properties of the various annealing gases. It is interesting to note, however, that in one recent test, very satisfactory results were obtained in the bright annealing of high-carbon wire in a specially prepared atmosphere, without decarburizing. Space limitations prevent going into more detail at this time with regard to the application.

From the brief description of various applications of controlled-atmosphere furnaces given above, it becomes apparent that this process offers very great advantages, both in the direction of lowered cost and in that of improved product to anyone concerned in the heating of steel or the more common non-ferrous metals. With the development of inexpensive gaseous mediums, and simple, rugged electric furnaces, this process bids fair to replace, at an early date, many of the older and more conventional means of heating of metals, with the result, not only of improving present methods, but also of introducing, in many cases, products new to the market and offering hitherto unobtainable characteristics for their further processing.

Public hearing on the code of the National Supply and Machinery Distributers' Association will be held in Washington on Sept. 27 at 10 o'clock. This is the third day of the association's annual convention to be held at the Wardman Park Hotel in that city.

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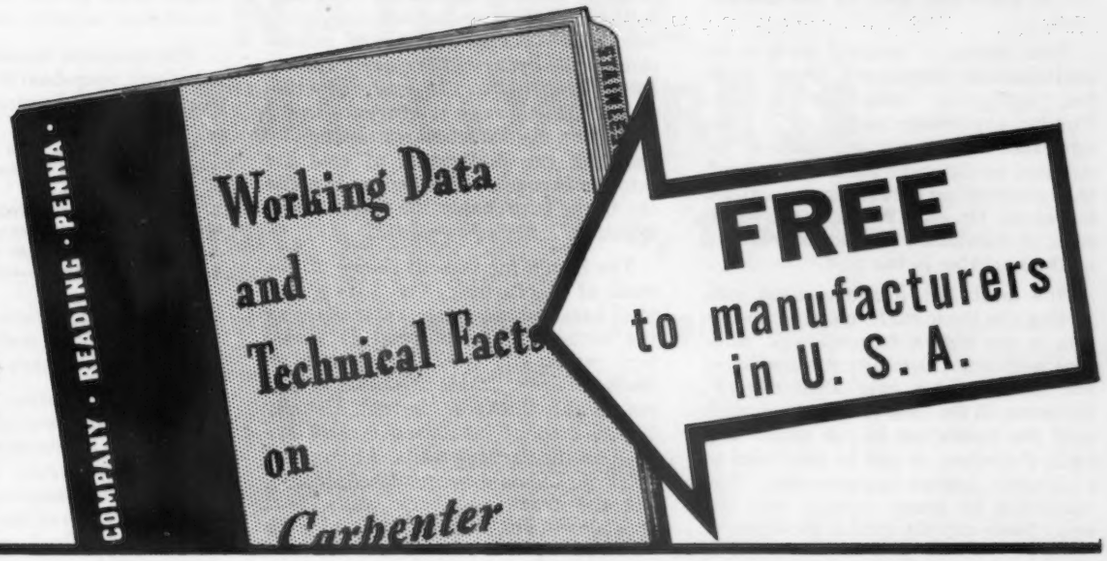

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Insulating the Open-Hearth Furnace

(Concluded from Page 37)

Thermocouples have been placed between the insulation and the brick of an open-hearth roof and many temperatures in the range of 2150 to 2200 deg. recorded. Sufficient insulation to secure this temperature may normally be used; any additional insulation would place the roof in the danger zone.

Four inches of mineral wool or its equivalent is considered about right for insulating open-hearth roofs. Further experience may show it to be advisable to vary the thickness of insulation on different parts of the roof, thus overcoming trouble from localized hot spots. On some furnaces the thickness of insulation should be reduced at the knuckles in the roof.

One must also guard against subjecting the inner surface of the insulation to too high a temperature. Mineral wool is not normally recommended for temperatures over 1800 deg. F. However, in the case of an open-hearth roof the insulation is not under any load; therefore, it can be subjected to a slightly higher temperature. The insulation in direct contact with the brick fuses slightly until a condition of equilibrium is reached protecting the rest of the insulation.

Insulation of Furnace Walls

After the roof of an open-hearth is insulated the insulation of all the remaining exposed brickwork naturally follows. Referring to the completely insulated furnace, Fig. 1, the insulation on the back wall is clearly shown. In addition to the expected reduction in heat loss through the furnace walls, insulation also effects large savings by reducing the infiltration of cold air into the furnace. Of these two benefits the latter is probably the more important.

The insulating cement shown on the walls of the furnace, Fig. 1, is a slag wool base cement using water glass as the binder. This material is mixed with water and trowelled directly on the brickwork. It can be put on in layers to any thickness desired. Usually 1½ to 2 in. of insulating cement are used on the furnace walls. All exposed brickwork should be insulated, including the front and back walls, port ends, downtake, slag pockets, and walls and roof of the regenerative chambers. The importance of preventing the infiltration of cold air was mentioned in the article on "Regenerative Chambers."

Another advantage of complete insulation of the open-hearth is that it permits the gas to be shut off entirely for a period of 18 hr. during the week-end shutdown, and still holds the furnace temperature high enough to protect the brickwork. This is just another item in the many ways that insulation helps to save fuel.

The complete insulation of a natural gas-fired open-hearth furnace should result in the following advantages:

1. **Reduced heat loss from the walls and roof.**
2. **Increased life of brickwork and longer furnace campaign.**
3. **Increased radiation from roof to bath.**
4. **Reduced infiltration of cold air.**
5. **Increased temperature of preheat.**
6. **Improved working conditions.**

All of these factors result in reduced fuel consumption and reduced rebuilding and maintenance costs.

Anyone operating an open-hearth furnace with natural gas or contemplating the conversion of a furnace to natural gas firing should certainly give careful consideration to the complete insulation of the furnace, because natural gas-fired open-hearths are particularly well adapted to insulation. They secure the maximum benefits of reduced fuel consumption and improved operation with the minimum risk of refractory failure due to localized hot spots or excessive wear that accompany other fuels.

The author wishes to express his thanks to the following men, each of whom offered suggestions that added greatly to the value of this series of articles: H. F. Miller, Jr., J. F. Richards, M. A. Smith, F. K. Buchanan, and W. S. Aylesworth.

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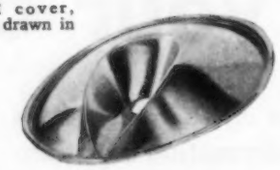

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Metal Trades Index of Employment Rises

THE employment index of the National Metal Trades Association, using the 1925-27 monthly average as a base, rose to 60.5 in August, an increase of 10.2 per cent over the preceding month. This index is based on reports from 26 cities. The association's index, based on reports from 14 industries, rose 10.7 per cent in August to 56.8. The largest gain, 14.3 per cent, came from the iron and steel industry.

The index of weekly earnings, using the same base increased 1.8 per cent to 65.1 during July, but was more than nullified by the cost of living rise, which amounted to 3.3 per cent, bringing the index to 72.9.

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First Issue of "Minerals Yearbook" Appears

IN the first issue of the *Minerals Yearbook* just published, the United States Bureau of Mines announces a change in the method of presenting statistics and economic discussions on minerals. This volume, bearing the date 1932-1933, furnishes timely statistical information regarding all commercially important minerals. It takes the place of *Mineral Resources of the United States*, which has been issued annually for over half a century, and presents a statistical and economic resume of conditions in the mineral industries that is of practical value in the task of recovery in these basic industries that employ more than 1,700,000 men and furnish over half the tonnage handled by railroads.

A review of our mineral industries reveals a recession during the last three years unprecedented in extent and duration, comments Scott Turner, Director of the Bureau of Mines, in the first part of the volume. This condition was due principally to the inability of markets to absorb the output of the mills and factories that normally provide an outlet for the products of mines and smelters, Mr. Turner states. Mineral producers marketed small quantities and obtained low unit prices.

During the five-year period 1925-29, when world output of minerals surpassed in quantity and value that of any other equal period in history, the total value was approximately 70 billion dollars, the annual average being about 14 billion dollars, Mr. Turner states. In 1930 this total annual value dropped to about 12½ billion dollars, 89 per cent of the average for the preceding 5-year peak period. In 1931 the total fell to about 9 billion dollars; in 1932 the value of world mineral production was, roughly, 7 billion dollars, one-half the yearly average from 1925 to 1929.

Domestic mineral production had a total value of about 29 billion dollars from 1925 to 1929, a yearly average of approximately 5.7 billion dollars. In 1930 it was 4.8 billion dollars; in 1931 the total had fallen to 3.2 billion dollars. For 1932 our mineral production was worth about 2.4 billion dollars, a decrease of around 57 per cent from the average value for the five-year period. Of the three main groups of minerals, the general recession has affected metals and mineral fuels least.

Greater convenience to the public is a feature of the supplanting of *Mineral Resources* by the *Minerals Yearbook*. The Yearbook is issued a relatively short time after the close of the year with which it deals, and it presents concisely in a single volume all essential data, arranged in a form well adapted to ready reference. A substantial reduction in the cost of publication will result, so the sales price set by the Superintendent of Documents will be correspondingly low.

Fifty-nine authors, all on the Bureau staff, contributed to the 61 economic and statistical surveys in this volume. There are 819 pages, divided about equally between descriptive text and charts and tables. The cloth binding is distinctive, and the volume provides the mineral industries with adequate data in more convenient form at an earlier date than elsewhere or heretofore available. Copies may be purchased by anyone for $1.25 from the Superintendent of Documents, Government Printing Office, Washington, D. C., to which official is delegated the sale of all Government publications.

The Structure of an Alloy Steel

(Concluded from Page 17)

longing the time of heating to and holding at $\theta_{max.}$ from 15 to 130 min.

The structure of the large grains in samples which had been heated for 130 min. at 850 and 865 deg. C., respectively, was a modification of Group 1. A photomicrograph of one of the large grains in sample N.S.187, which had been heated to and held at 865 deg. C. during 130 min., is shown in Fig. 23. This sample cooled from 850 to 350 deg. C. in 185 sec. Fan-shaped areas of distinctly heavier tone than the main body of conglomerate appear to radiate inwards from three foci in the boundary. It is not impossible that the dark areas within the large crystal in Fig. 23 are sections of hemispherical bodies originating at foci on the crystal boundary either below or above the surface exposed for examination. Emphasis should be placed upon the difference between the structure at the center of this large grain (which can best be described as incipient Widmanstatten) and that at the center of the large grain shown in Fig. 21; the latter represents the structure of a sample (N.S.188) heated for the same time to a temperature 11 deg. C. higher and cooled from 850 to 350 deg. C. at about the same rate (actually in 192, instead of 185, sec.).

It would appear that the production of the Widmanstatten structure in the larger grains of samples containing both large and small crystals is facilitated as $\theta_{max.}$ is raised from 850 to 900 deg. C. Confirmation of this view is afforded by sample N.S.174 which, it may be remembered, was heated to and held at 900 deg. C. during 130 min. and was cooled from 850 to 350 deg. C. in 189 sec. The structure within a large grain in this sample was shown in Fig. 21. It was characteristic of all the large grains in the sample and was of Group 3, Table I.